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EXPERIMENT STATION RECORD

Vol. 76 JANUARY 1937 No. 1

THE FIFTIETH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The Association of Land-Grant Colleges and Universities held its fiftieth annual convention in Houston, Tex., from November 16 to 18, 1936. It was the first visit of the association to the region and the first since 1921 south of Mason and Dixon's line.

Apparently the attendance was but little affected. The registration approximated 400, with every State and every member institution represented. Considerable local interest increased the number of visitors, especially from the Texas A. and M. College. A visit to College Station immediately following adjournment provided further direct contacts with that institution.

The central theme for discussion by the convention was that of land use, the keynote being sounded effectively by the president of the association, Dr. J. G. Lipman of New Jersey, in an address entitled The Land-Grant and Our Land. President Lipman recalled the early exploitive policy and the gradual shifting of emphasis to that of conservation, and pointed out the responsibilities of the land-grant institutions as beneficiaries in the grants and as coworkers with the Federal Department of Agriculture and other agencies in developing and making effective an enlightened land use program. Among further contributors to the discussion were M. L. Wilson, Assistant Secretary of Agriculture, who discussed National Land Policies and the Democratic Process; Dr. L. C. Gray of the Federal Resettlement Administration, who considered The Influence of Our Land Use Policies on Our National Progress; M. L. Cooke, Administrator of the Federal Rural Electrification Administration, on Our Water Resources in Relation to Land Use; Extension Director H. C. Ramsower of Ohio on A Land Use Program the Basis of the Agricultural Conservation Programs; Extension Director William Peterson of Utah on Federal Irrigation Reclamation in Relation to Agricultural Policy, with discussion by Director C. E. Ladd of New York; Director W. L. Slate of Connecticut on Suggestions for the More Complete Utilization of Uncultivated Areas for Recreational Purposes; J. B. Kincer of the U. S. D. A. Weather Bureau on The Relation of Climate to Agriculture; and President F. D. Farrell of Kansas on Some Obstacles to Land Conservation. Mention should also be made of the comprehensive report by a special joint com-

mittee of the association and the Department on the conservation and use of our national phosphate resources.

Another important group of papers dealt with Federal agricultural policies and the relation of the land-grant institutions to the farm program. The address of the Secretary of Agriculture Henry A. Wallace, entitled Responding to Change in Agriculture, gave special consideration to the problems of crop insurance and farm tenancy. It also discussed the subject of organization and reorganization, stating that "first, behind and underneath organization for maximum effectiveness it is essential that objectives and purposes be clear. . . . Secondly, there must be a clean-cut division of functions as a basis for understanding, for orderly operation and efficiency. Third, there must be cooperation from the top to the bottom of the ranks, at headquarters and in the field."

Supplementing this address were two papers by H. R. Tolley, Administrator of the Agricultural Adjustment Administration. The first of these was entitled The Farmer, the College, the Department of Agriculture—Their Changing Relationships. The second dealt with The Agricultural Conservation Program and Extension Work. Coordination of Federal Agencies Working in Agricultural and Related Programs was discussed by Directors C. W. Warburton of the U. S. D. A. Extension Service and I. O. Schaub of North Carolina, and Coordinating Federal Agencies in the State With Activities Affecting Agriculture by Directors F. A. Anderson of Colorado and C. E. Brehm of Tennessee.

Relations of the association with agencies other than the Department also received attention. A paper presented by Dr. F. J. Kelly, specialist in higher education, on behalf of the U. S. Commissioner of Education, emphasized the interest and responsibilities of the Office of Education in educational policies and programs involved in the expenditure of Federal funds, and advocated the provision on a cooperative basis of a staff of experts to assist the land-grant institutions in their instruction problems. Major General H. J. Brees, commanding the Eighth Corps Area of the Army, and Major Ross C. Baldwin of the General Staff Corps expressed the interest of the War Department in the Reserve Officers' Training Corps. Edward O'Neal, president of the American Farm Bureau Federation, and Harold W. Gaulrapp, representing the National Grange, brought greetings from their respective organizations.

Problems relating to research were accorded generous consideration. The principal topics were some essentials for further progress in agricultural research, what should be included in agricultural economics research programs, the use of Bankhead-Jones funds to promote a coordinated program of research between the States in cooperation with the U. S. Department of Agriculture, professional improvement

for the experiment station staff, and important implications of cooperative research in home economics. A paper by Dean E. M. Freeman of Minnesota before the joint session on agriculture, entitled Projects—Benign and Malignant, was also of direct interest to all research workers and administrators. Following the plan of recent years, a more detailed discussion of these research papers will appear in the February issue of the *Record*.

The sessions of the executive body, which is the legislative agency of the association, were as usual held behind closed doors, but a rearrangement of the convention program permitted a detailed report to a general session of the convention just preceding adjournment. This report, presented by the chairman of the executive committee, Provost A. R. Mann of Cornell University, served to acquaint those present with the decisions which had been arrived at, and in this way unified and gave point to the program as a whole.

Specifically, the association favored full coordination of activities for agricultural betterment and the elimination of overlapping; the early completion of the soil survey; the purchase of submarginal land and the conservation of phosphate resources; appropriations for agricultural extension on a permanent basis in lieu of recent curtailments; additional Federal legislation for farm forestry, so formulated as to safeguard the interests of the agricultural experiment stations and extension agencies; further study of retirement provisions and group insurance; the better accrediting of academic work in agriculture and home economics; and more adequate provision for fitting graduates for Federal service. Announcement was made that on the much discussed question of the relation of State institutions to soil conservation programs the consensus of opinion favored an acceptance of responsibility, but with full realization that the extent of participation is a problem for the individual institutions themselves.

The election of officers resulted in the advancement to the presidency of the vice president, Dr. Alfred Atkinson, president of the Montana State College. R. L. Sackett, dean of engineering in the Pennsylvania State College, was chosen vice president, and Dean and Director T. P. Cooper was reelected secretary-treasurer. President C. A. Lory of Colorado, a member of the executive body since 1926, was succeeded by President T. O. Walton of Texas. A list of the section officers and changes in committee assignments is given on page 144 of this issue.

Steps were taken in anticipation of the 1937 meeting to commemorate a triple anniversary—the seventy-fifth anniversary of the Morrill Act and the act establishing the Federal Department of Agriculture and the fiftieth anniversary of the passage of the Hatch Act. A joint committee headed by Dr. Lipman for the association and R. F. Hendrickson for the Department was appointed to make plans for a suitable observance of these anniversaries, and it may be expected that the next meeting will be largely built around these celebrations.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical work of the Kentucky Station] (*Kentucky Sta. Rpt. 1935, pt. 1, p. 16*).—The station reports on experiments with a modification of the spectroscopic method for the determination of boron and with a new indicator for fluorine, thorium alizarine sulfonate.

Analyses of miscellaneous materials, A. W. Clark (*New York State Sta. Circ. 165 (1936), pp. 10*).—"In addition to the regular inspection of official samples of feeds, fertilizers, and agricultural liming materials, samples of miscellaneous materials, particularly agricultural and industrial wastes, have been analyzed to determine the possibility of their utilization as fertilizer materials or animal feeds." Table 1 records the plant food constituents found in a wide variety of miscellaneous materials; table 2, the protein, fat, fiber, water, ash, and nitrogen-free extract of numerous feeding stuffs; table 3, the calcium and magnesium oxide contents of liming materials and of various substances proposed for this use; and table 4, some of the components of muck soils, peat, peat moss, etc. Certain "materials requiring special analysis" are also listed, with the results of their examination.

Butyric acid by fermentation, R. Arroyo (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 2, pp. 629–647*).—The author reports the isolation in pure culture of an organism well adapted for the production of butyric acid from molasses diluted with 7 times its weight of water and treated with 13.5 g of calcium carbonate per 100 g of molasses. This mixture was sterilized by heating at 10 lb. pressure in an autoclave, cooled, and inoculated.

"The process is simple, inexpensive, and merits further efforts toward its industrial application and commercial exploitation. The main end product of fermentation (normal butyric acid) is obtained in nearly theoretical yield, and of a splendid degree of purity—99 percent or better."

Fermentation of pyruvic acid by bacteria of the colon-aerogenes group, M. Mickelson, H. Reynolds, and C. H. Werkman (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 748–750*).—This is a contribution by Iowa State College.

A discrepancy between biological assays and other methods of determining vitamin A.—I, R. S. Morgan, J. R. Edisbury, and R. A. Morton (*Biochem. Jour., 29 (1935), No. 7, pp. 1645–1660, figs. 2*).—In this investigation determinations for vitamin A were made by the method of biological assay, the measurement of the ultraviolet absorption at 328 mμ (E. S. R., 60, p. 689), and the evaluation of the blue color intensity in the antimony trichloride test (E. S. R., 56, p. 10) on a series of 22 oils and concentrates covering a range of potency of from 530 to 1,290,000 international units per gram. The potency of "100" percent vitamin A was calculated from the assay of each substance and from the physicochemical tests. The characteristics of a highly active vitamin A described by Carr and Jewell (E. S. R., 69, p. 325) were taken as those of the pure substance. The variations in the assays when so expressed were from

1.23 to 3.38 million units per gram, or a mean of 1.77, when calculated from the blue values and from 1.08 to 2.9 million units per gram, or a mean of 1.73, when calculated from the spectroscopic estimates. "This variation is greater than can be accounted for by the known errors of the assays and the physicochemical measurements; allowance for these errors leaves a range of variation from 67 to 150 percent of the mean value to be accounted for."

Making grape juice in the home, C. S. PEDERSON and D. K. TRESSLER (*New York State Sta. Circ. 166 (1936), pp. 7, figs. 6*).—The equipment necessary for the home preparation of grape juices is briefly discussed, two simple pressing devices and two methods of sealing with crown caps being described and illustrated, as are also pasteurization methods and satisfactory procedures for aging to precipitate argols and for the second pasteurization and rebottling.

"*A good extraction is not obtained at a temperature below 140°, while at* temperatures above 145° too much of the tanninlike substances are extracted, resulting in a more bitter juice. The method of hot pressing of grape juice is more adaptable for preparing grape juice in the home than cold pressing."

AGRICULTURAL METEOROLOGY

An introduction to the study of air mass analysis, J. NAMIAS (*Bul. Amer. Met. Soc., 17 (1936), No. 6–7, pp. 11+159–242, figs. 10*).—This is a third edition, revised and enlarged. It was prepared because of the rapidly increasing adoption of air mass analysis and methods by meteorologists, and because there is no elementary textbook which deals with many of the fundamental processes which must be understood before beginning a study of air mass analysis.

Disperse systems in gases: Dust, smoke, and fog, R. WHYTLAW-GRAY ET AL. (*Faraday Soc. Trans., 32 (1936), No. 8, pp. 1041–1300, pls. 4, figs. 64*).—This is an account of a general discussion (with papers) held by the Faraday Society in April 1936. The subject is considered under two heads, (1) The General Properties and Behavior of Disperse Systems, composed of (*a*) Solid and Liquid Non-Volatile Particles, i. e., Smoke, Dust, Oil Fogs, etc., and (*b*) Aqueous and Other Volatile Particles, i. e., Mist, Cloud, Hygroscopic Nuclei, Town and Country Fogs; and (2) The Industrial Aspects of Disperse Systems in Air and Gases.

Dust storms over the Great Plains: Their causes and forecasting, G. R. PARKINSON (*Bul. Amer. Met. Soc., 17 (1936), No. 5, pp. 127–135, figs. 9*).—This article discusses the results of a survey by airplane and otherwise of the dust-storm area from Kansas City, Mo., to Albuquerque, N. Mex., and other places, dealing especially with sources of the dust, characteristic properties of the air masses causing the dust storms, and possible forecasting of the storms. The author says that much further information is needed in order to forecast these storms successfully, principally upper-air observations in the dust-storm territory.

Further evidence on the dependence of terrestrial temperatures on the variations of solar radiation, C. G. ABBOT (*Smithsn. Misc. Collect., 95 (1936), No. 15, pp. 4, figs. 2*).—Further evidence is given which confirms previous conclusions (E. S. R., 75, p. 746) that "opposite changes of solar radiations are associated for at least two weeks after their commencement with opposite marches of temperature departures in weather. These average effects are of the order of several degrees Centigrade, although the solar changes on which they depend are only of the average range of about 0.7 percent."

A six-year weather cycle [trans. title], R. SPITALER (*Met. Ztschr.* [*Braunschweig*], *53* (*1936*), *No. 7, pp. 251–254*).—Observations by the author and others are offered as evidence of a 6-yr. weather cycle, especially with reference to temperature. The author says that although the 6-yr. weather cycle is still too uncertain for an active and conclusive long-range weather prediction, it does give, for particular reasons, several seemingly trustworthy indications of the coming weather, and, in addition, it has the advantage over other periods of being based on a geophysical phenomenon, namely, the declination of the axis of the earth.

Effective precipitation in relation to crop yields (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, CRP-1, pp. 2, pl. 1*).—Proceeding on the assumption that the effectiveness of spring precipitation is directly proportional to the condition of the crop, an index of effective precipitation was calculated by multiplying the spring precipitation in each year by the April 1 condition of winter wheat in that year. Substituting these indexes for the precipitation totals originally used brought a marked improvement in correlation between precipitation and yields.

Work in agricultural meteorology of the National Meteorological Institute of Poland [trans. title], J. LUGEON (*Les Travaux de météorologie agricole de l'Institut National Météorologique de Pologne. Warszawa* (*Warsaw*): *Państ. Inst. Met., 1935, pp. 31, pls. 2, figs.* [*4*]; *abs. in Bul. Amer. Met. Soc., 17* (*1936*), *No. 3, pp. 85, 86*).—This report describes the crop weather service developed by the Polish National Meteorological Institute since 1930, for the purpose of making, in cooperation with various other agencies, special agro-meteorological observations; publishing and broadcasting reports and forecasts for farmers; making phenologic surveys; recording observations on solar radiation, soil temperatures, and hail; and making theoretical and experimental study of the data obtained. In addition to the regular reports on the usual climatological data, special reports are issued during the growing season on phenological dates, influence of temperature and precipitation variations on plant growth, effects of hailstorms, and the general influence of atmospheric conditions on agriculture as a whole. Phenological dates are not confined to natural vegetation, but are also given for cultivated crops.

An elaborate synoptic code has been devised by which the more than 600 cooperating phenological observers send in their reports every week by telegraph. The code "provides for reports on fall and spring wheat, potatoes, sugar beets, hay and pasture, dwarf elder, fruit trees, plant diseases, destructive insects, and weed pests. An annual phenological summary is also published. There are 57 solar radiation stations, and 100 soil temperature stations reporting readings at 2 cm to 2 m depth. For the hail studies there are about 8,500 reporting stations."

[**A climatic map of Czechoslovakia**], B. HRUDIČKA (*Spisy Přírod. Fakult. Masaryk. Univ., No. 206* (*1935*), *pp. 5, pl. 1*).—A map based on Köppen's classification is given and explained.

SOILS—FERTILIZERS

[**Soil and fertilizer studies by the Arizona Station**] (*Arizona Sta. Rpt. 1935, pp. 8–10, 11–16, 17, 18*).—Results are briefly reported on the use of ammonium phosphate for alfalfa, sources of nitrogen for Arizona soils, citrus tree decline, sulfur fertilization, soil reaction studies (including the hydrolysis of zeolites and carbonates), boron, and soil and water classification for agricultural adjustment.

[Soil and fertilizer work of the Kentucky Station] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 16–18, 20–24*).—Report is made upon the effect of copper and other minor elements on the growth of plants, the effect of potassium iodide on corn, fertilizer studies on the soil experiment fields, the residual effect of superphosphate and rock phosphate, the effect of liming on availability of rock phosphate, availability studies of various phosphates, the retention of rock phosphate in the topsoil, and nitrogen in the soil as affected by cropping practices.

[Soil and fertilizer notes from the Tennessee Station] (*Tennessee Sta. Rpt. 1935, pp. 9, 10, 22–28*).—A tentative grouping of Tennessee farm lands into five grades of soils is presented, together with data by W. H. MacIntire on the effects of calcium and magnesium, potash, phosphorus, and sulfur, the leachability of various nitrogenous materials, the chemical properties of the calcium silicate "slag" from the pyrolytic production of phosphoric acid, and the chemical changes and physical effects that result from admixtures of limestone and dolomite with triple superphosphate.

[Soil Survey Reports, 1931 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 11, pp. 32, figs. 2, map 1; 23, pp. 54, pl. 1, figs. 4, map 1; 25, pp. 45, figs. 3, map 1*).—These surveys were carried out with the cooperation, respectively, of the West Virginia Geological Survey and Experiment Station, the California Station, and the Kentucky Station.

No. 11. *Soil survey of Randolph County, West Virginia*, B. H. Williams and H. M. Fridley.—Randolph County contains an area of 663,040 acres in east-central West Virginia, the greater part of this area being "included in three massive mountain ranges. A deeply dissected plateaulike area, about 10 by 30 miles in extent, occupies the western and southwestern parts." Drainage is provided by the Tygart, Cheat, Buckhannon, Elk, and Gauley Rivers and their tributaries.

Aside from the 40 percent of rough stony lands from the mountainous areas included in the county, the soils were found to constitute 12 series, including 21 types, Leetonia stony loam amounting to 10.1 percent and Upshur stony silt loam to 9.9 percent of the area.

No. 23. *Soil survey of the Alturas area, California*, E. J. Carpenter and R. E. Storie.—The Alturas area covers 570,240 acres in northeastern California, the area having been considered, for the purposes of the survey here noted, in three separated units, excluding intervening strips of mountainous land. The drainage of the eastern and northern parts empties into enclosed basins or playa lakes, and drainage from the southern, central, and southwestern parts reaches the Sacramento River by way of the Pit River which has its source largely within the area.

Soils of 14 series and of 27 types were found in the Alturas area, Gleason stony clay loam amounting, with the inclusion of a steep phase, to 16 percent and Lassen stony clay to 13.2 percent, while rough stony and scab lands, muck, and peat were found to form a total of 15.9 percent of the area examined.

A discussion by C. F. Shaw of laboratory studies of the soils of the area is included.

No. 25. *Soil survey of Fayette County, Kentucky*, H. W. Higbee and K. S. Venable.—Fayette County consists of 181,120 acres of undulating plain in central Kentucky. For its drainage the county is dependent mainly upon the Kentucky River, with North and South Elkhorn Creeks.

With the inclusion of two color phases, a slope, and an imperfectly drained phase, Maury silt loam forms 49.1 percent of the county, and Mercer silty

clay loam, found only in the form of its eroded phase, constitutes 12 percent of the county. In all, 14 series, including 18 types, were found.

Chemical analyses of the more important soils are reported and discussed by O. M. Shedd.

Chemical analyses of Iowa soils for phosphorus, nitrogen, and carbon: A statistical study, R. H. Walker and P. E. Brown (*Iowa Sta. Res. Bul. 203* (*1936*), *pp. 57–104, figs. 8*).—On the basis of data now available for 77 counties of the State, "in spite of the variability within soil types the differences among types, in most cases, were found to be significant or highly significant. Certain soil types were found to be similiar in their phosphorus, nitrogen, and carbon content, but significantly different from other soils. In general, surface soils contained larger quantities of phosphorus, nitrogen, and carbon than subsoils. Dark-colored loess soils contained larger quantities of phosphorus, nitrogen, and carbon than light-colored loess soils. Fine textured soil types contained larger quantities of phosphorus, nitrogen, and carbon than the coarser textured types of the same series or of different series. A high or low phosphorus, nitrogen, or carbon content, however, seems to be a series characteristic entirely apart from the textural influence. This appears to be related to the topography and native vegetation factors. The loess soils as a group do not differ from the drift soils either in their phosphorus, nitrogen, or carbon content nor in the carbon: nitrogen ratio. The bottom land soils, however, contain significantly larger amounts of phosphorus, nitrogen, and carbon than the terrace soils, but the two groups do not differ in their carbon: nitrogen ratio. The terrace and bottom land soils as a group contain significantly larger quantities of phosphorus and nitrogen than the loess and drift soils, but the difference in carbon is hardly large enough to be significant. There is little, if any, difference in the carbon: nitrogen ratio.

"The mean carbon: nitrogen ratio for all soils of Iowa was found to be 12.15: 1, but the largest number of soils had a ratio slightly lower, the mode of the frequency distribution curve being at 12: 1. The close relation between the nitrogen and carbon content of Iowa soils is shown by the high correlation coefficients, which were found to be 0.95 for the drift soils and 0.93 for the loess soils. Although the temperature and humidity factors are of primary importance in determining the nitrogen and carbon content of soils, it appears that within the comparatively narrow range of variation of these factors within the State of Iowa, the factors of topography, soil texture, and type of vegetation have been of greatest importance in the differentiation of soil types.

"In general, the results of this study support the soil type concept now in use in soil classification."

The relation of buffer capacity and organic matter to the solubility of the nutrient elements in Toa silt loam, A. Vélez Franceschi (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *20* (*1936*), *No. 2, pp. 655–679, figs. 6*).—"The buffer curves for [six] different samples of Toa silt loam show that the presence of larger amounts of organic matter markedly increases the buffer capacity near neutrality. This is reflected in the flatter buffer curves. The samples which contained lower quantities of organic matter are most highly buffered at the extreme ranges of high acidity and basicity. This is indicated by typical sigmoid buffer curves. The state of the decomposition of the organic matter in these samples indicates . . . that the buffering effect of the organic matter is associated with the lignin-humus fraction."

Additions of acid to the soil increased the solubility of the nutrient mineral elements. The increases in the solubilities were greatest in the samples but were low in organic matter. Although liming increased the amount of the soluble cal-

cium in the soil, it did not decrease the solubility of the phosphorus. The additions of lime decreased the solubility of potassium. "The solubilities of iron and manganese were too low to be easily measured above pH 7.2 and in only one case above pH 5.0." Additions of acid to the soil increased the solubility of potassium when the reaction was forced lower than pH 5.0. There was a greater increase in the solubility of potassium from the acid treatments in the samples that were lower in organic matter. The solubilities of iron and manganese were increased from additions of acid. Manganese became much more soluble than iron from increased acidity, and its solubility was more affected in the samples that were low in organic matter.

The movement of salt (alkali) in lettuce and other truck beds under cultivation, W. T. McGeorge and M. F. Wharton (*Arizona Sta. Bul. 152 (1936), pp. 389–438, figs. 14*).—"During the culture of truck crops on raised beds, there is a considerable movement and accumulation of soluble salts in the beds, but on disking down and flooding after harvest the distribution of salts in the soil returns approximately to its original condition. The principal accumulation is of nitrates, chlorides, and sulfates of the alkali and alkaline earth bases as these are the most mobile salts. The rate and amount of salt movement in the beds is a function of the type of bed and the quantity of irrigation water applied as well as the length of the run. The salt movement closely precedes the degree to which the irrigation water penetrates the bed, hence the relation of salt accumulation to length of irrigation run and quantity of water applied at each irrigation. The greatest salt accumulation occurs in the centers of the convex beds. The least salt accumulation takes place in the high beds of the type used in cantaloup culture. The subsoil under the beds has a higher salt content than the surface soil of the furrow. The 3-in. crown beds show the least concentration of salt on the bed shoulder.

"A notable movement of potassium was observed. Like the other elements, it moves toward the center of the beds, but more slowly because its movement depends, in large part, on base-exchange reactions.

"The least amount of movement was observed for phosphate, and this was negligible except when soluble phosphate fertilizers were applied. Calcium nitrate increased the solubility and mobility of phosphate. There was a measurable increase in soluble phosphate in the bed centers following calcium-nitrate fertilization. When added as ammonium phosphate, phosphate showed a considerable lateral movement to the center of the beds and a very active movement into the subsoil of the furrow.

"Under late fall and winter conditions the trend of salt movement is the same as in summer, but the magnitude of the movement is less.

"This investigation shows that crowned beds of one or more inches are the most satisfactory for bed culture because there is a lower concentration of salt at the shoulder, where the plants are located."

Oxidation-reduction potentials of soil suspensions in relation to acidity and nitrification, M. C. Darnell, Jr., and W. S. Eisenmenger (*Jour. Agr. Res. [U. S.], 53 (1936), No. 1, pp. 73–80, fig. 1*).—In an investigation carried out at the Massachusetts Experiment Station soils collected under four distinct natural drainage conditions were limed at the rate of 7.5 tons per acre, subjected to nitrogenous fertilizer treatments, held under greenhouse conditions after these treatments, and periodically examined with respect to the effects of nitrification, degree of acidity, source of nitrogen, etc., upon the oxidation-reduction potentials of their aqueous suspensions.

The nitrogen treatments were 30 mg of nitrogen per 100 g of soil added as ammonium sulfate or sodium nitrate, and 1 g of dried blood (containing 10 percent of nitrogen) per 100 g of soil.

The soils used were a well-drained sandy loam pasture soil, the same soil in a natural waterlogged condition, a gravelly sand from a railroad fill, and a black, sandy swamp soil.

"It was found that any change of potential with nitrification is secondary to the effect of nitrification on pH. The inverse relationship found independently by Herzner, Willis [E. S. R., 68, p. 448], and Heintze [E. S. R., 71, p. 446] to exist between pH and Eh was verified. The addition to the soils of $(NH_4)_2SO_4$ or $NaNO_3$ was found to have no constant effect on the potentials of the suspensions. The rapid decomposition of organic matter brought about a marked fall of potential. This fall was apparently caused by oxygen depletion."

The effect of soil treatment on the mineral composition of exuded maize sap at different stages of development, M. W. Lowry, W. C. Huggins, and L. A. Forrest (*Georgia Sta. Bul. 193 (1936), pp. 28, figs. 12*).—The authors made determinations of various components of exuded corn sap from plants from 3 to 4 ft. high, from plants showing the first appearance of the tassel, and from plants at the roasting ear stage. The method for collecting the sap devised by Lowry and Tabor[1] is described.

From the figures given it appears that the rate of flow of the sap varied with the amount of the rainfall when the total was less than that required to saturate the soil. Lime increased the yield of sap. The highest yields of sap on limed plats were obtained under treatments of superphosphate alone and in combination with ammonium sulfate or potash, whereas the lowest yields were obtained under treatments with ammonium sulfate and potash alone and in combination.

It is stated that, "in general, the H-ion concentration of the sap was highest in the second stage of growth. However, the plats receiving potash and phosphates tended to show an increase in H-ion concentration with the development of the plant, also the concentration of phosphorus and total nitrogen in the sap from plants grown on these plats increased with successive stages of growth."

It was further found that "the addition of lime to the soil increased the quantities of ash, calcium oxide, total nitrogen, and nitrate nitrogen found in the exuded sap, and decreased all other constituents. The exudate from plants in the first and second stages of growth receiving treatments of single fertilizer materials contained a larger amount of ash than that from plants grown on treatments receiving combinations of fertilizer materials. Lime increased the quantity of calcium found in the exuded sap in all stages of growth. The lowest quantities of calcium were found in the sap from plants grown on plats receiving potash and nitrogen, either alone or in combination. The highest quantities were found under treatments with acid phosphate with nitrogen and rock phosphate alone and in combination with potash, which is perhaps caused by the high calcium content of the phosphate fertilizer materials. Lime tended to decrease the amount of potash in the exuded sap. In general, the sap from plants grown on treatments receiving potash fertilizers contained more potash than those not having received applications of potassium fertilizers. The quantity of silica found in the exuded sap increased with successive stages of growth. Lime tended to decrease the concentration of silica found in the sap. The amount of phosphorus found in the sap increases with successive stages of growth. In most cases, applications of phosphate fertilizers increased the quantities of phosphorus in the sap. Lime had the effect of slightly increasing the total and nitrate nitrogen content of the exuded sap. Nitrogenous fertilizer materials generally increased the total and nitrate nitrogen content of the sap."

[1] Science, 73 (1931), No. 1895, p. 453, fig. 1.

The effect of fertilizers and lime upon the electrodialyzable and exchangeable potash of cropped soil, G. M. GILLIGAN (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 1, pp. 61–66*).—Fertilizer plat soils were subjected, in an investigation reported from the Delaware Experiment Station, to electrodialysis and to leaching with neutral ammonium acetate to determine the effect of fertilizers, cropping, and liming upon the amount of potassium removed by these methods.

"Without exception, more potash was removed by electrodialysis from the limed soils than from the unlimed. The results for exchangeable potash were similar but of lesser magnitude. Applications of potash were reflected to a greater degree by electrodialysis than by the exchange method. Exchangeable and dialyzable potash were at a maximum in the plat receiving manure plus lime. . . . Without exception, total potash content of the soil was greater in the limed series. For the soil investigated it appears that liming has conserved potash by reducing losses from leaching."

"pH values were remarkably uniform throughout each series (limed and unlimed)."

Fertilizer placement studies with cotton in Texas, 1935, H. P. SMITH (*Natl. Joint Com. Fert. Appl. Proc., 11* (*1935*), *pp. 67–72; abs. in Texas Sta. Circ. 78* (*1936*), *p. 24*).—This report extends that of the previous year (E. S. R., 74, p. 607). When fertilizer was placed 1, 2, and 3 in. underneath cottonseed at the time of planting, slightly better stands were obtained for the 3-in. placement and slightly better yields for the 2-in. depth. Fertilizer placed 2.5 in. to each side and 1, 2, and 3 in. below the level of the seed gave results slightly in favor of the 2- and 3-in. depths. Disturbing the soil under the seed at the time of planting retarded germination regardless of whether or not any fertilizer was applied.

Drilling fine limestone for legumes, W. A. ALBRECHT (*Missouri Sta. Bul. 367* (*1936*), *pp. 20, figs. 13*).—The methods and advantages of drilling finely ground limestone for legumes are set forth in detail. Limestone, according to research at the station, supplies calcium as a nutrient as well as for correction of soil acidity. The requirement of finely ground (about 40-mesh) material and possible use of other forms of calcium and the greater effectiveness of smaller quantities drilled compared with broadcasting are pointed out. Fine limestone can be drilled with the fertilizer attachment of the grain drill when legumes are planted in the spring or with wheat or other nurse crop in autumn. Drilling limestone for each legume crop in the rotation is advised. Limestone alone does not guarantee clover stands, and its use emphasizes other deficiencies in soil fertility. Many soil types are mentioned as responding to fine limestone treatment. In cost of limestone, drilling 0.25 ton of finer limestone costs less than broadcasting 2 tons of 10-mesh material per acre, and drilling also effects a substantial saving in labor.

The reaction of zinc sulfate with the soil, H. W. JONES, O. E. GALL, and R. M. BARNETTE (*Florida Sta. Bul. 298* (*1936*), *pp. 43, figs. 6*).—The authors find that the method for the titration of zinc with potassium ferrocyanide in the presence of potassium ferricyanide and with diphenylbenzidine as an internal indicator may be applied accurately for the determination of 5 mg of zinc in water and normal ammonium chloride extracts of soils, with fairly accurate estimations of smaller quantities. They further state that "iron, the most important element interfering with the determination, may be satisfactorily separated by precipitation as the hydroxide in the presence of an excess of ammonium chloride and ammonium hydroxide. The separation of iron and zinc by this method has been found to be satisfactory up to a concentration of iron four to five times as great as that of zinc."

Zinc compounds applied to the soil were found to remain in the three forms of water-soluble compounds, replaceable zinc, and a state of combination in which the zinc was neither water-soluble nor replaceable. "When low concentrations of soluble zinc compounds react with the soil, the major portion of the zinc enters into combination with the colloidal complexes and may be replaced by a normal ammonium chloride solution. Under these conditions there is a near equivalence between the replaceable zinc of the soil and the calcium removed from the colloidal complex. When high concentrations of soluble zinc compounds react with the soil, the zinc is found present not only in water-soluble and replaceable forms but also in an insoluble form. After the major portion of the exchangeable bases are replaced by zinc, the zinc enters into this insoluble form in the soil.

"Organic matter, clay, replaceable bases, carbonates, and phosphates were found to influence the fixation of zinc in the soil. Superphosphate in contact with zinc sulfate in the soil decreased the solubility of the zinc and increased the fixation of insoluble zinc. A marl and a peat soil fixed very much greater quantities of zinc in an insoluble form than did acid mineral soils. The water-soluble zinc content of acid mineral soils was increased in most instances by row and broadcast applications of zinc sulfate. The greatest increase occurred immediately after application. Water-soluble zinc leached into and was fixed in part by the lower soil depths. Applications of zinc sulfate to field soils increased the replaceable zinc content of the 0–3 and 3–6 in. soil depths. In a Norfolk sand, zinc was found to be toxic to cowpeas at a concentration of approximately 0.482 milliequivalent per 100 g of air-dried soil and to corn at 1.376 m. e. per 100 g." The addition of calcium carbonate appears to have decreased the toxic action of replaceable zinc.

AGRICULTURAL BOTANY

[Abstracts of dissertations] (*Ohio State Univ., Abs. Doctors' Diss., No. 16 (1934), pp. 213–222, 243, 244*).—Abstracts of the following theses of interest to botany are included: The Chlorophyceae and Heterophyceae of Oklahoma, by C. E. Taft; and The Significance of Thermal Emissivity in Plant Leaf Energetics (with experiments on the leaves of *Liriodendron tulipifera*, *Coleus blumei*, and *Bryophyllum calycinum*, and including the presentation of an exact laboratory method for the determination of thermal emissivity), by A. N. Watson.

Kansas botanical notes, 1934, F. C. GATES (*Kans. Acad. Sci. Trans., 38 (1935), pp. 99, 100*).—This contribution by the Kansas State College contains miscellaneous notes, including data on plant distribution and collections and the effects of meteorological factors on various plant species.

Ecological studies in the lower Illinois River Valley, L. M. TURNER (*Bot. Gaz., 97 (1936), No. 4, pp. 689–727, fig. 1*).—In this study from the University of Arkansas, the soil types of Pike and Calhoun Counties were correlated as far as possible with the plant communities growing therein. The narrow pH range appeared to indicate that it is not important in the distribution of species here. A transect of the lower valley afforded 4 general divisions (upland, bluff, transition region, and flood plain), with subdivisions into 10 major plant communities (upland pasture and old fields, upland forest, limestone bluff, hill-side-talus slope forest, talus slope-flood plain transition forest, flood plain forest, flood plain prairie, flood plain lakes and sloughs, riverbank, and islands), which are discussed in detail.

Andrews Bald: The problem of its origin, B. W. WELLS (*Jour. South. Appalachian Bot. Club, 1 (1936), No. 5, pp. 59–62*).—In this contribution from the North Carolina State College, the hypothesis is presented that this

ancient bald could have originated only through human interference at the soil level, an interference with the normal forest succession, making possible the advent of the remarkable mountain oatgrass (*Danthonia compressa*) which, once having attained command of the area, has with, and for long periods without, the aid of fire been able to survive as an unusual type of subclimax to hold the area for centuries against the surrounding forest. The hypothesis refers only to certain grass and sedge balds of the Andrews Bald type and not to balds known to have been made by white settlers, or to the extensive shrub balds or "slicks" ascribed to various combinations of soil, fire, exposure, and the human factor.

Forms of Crataegus pruinosa, H. W. Rickett (*Bot. Gaz., 97 (1936), No. 4, pp. 780–793, figs. 8*).—This taxonomic (three new forms described) and morphologic study is a contribution from the University of Missouri.

The development of the ascocarp of Acrospermum compressum, H. Brandriff (*Mycologia, 28 (1936), No. 3, pp. 228–235, figs. 11*).—This is a contribution by Cornell University.

Effects of barium salts upon Aspergillus niger and their bearing upon the sulphur and zinc metabolism of the fungus in an optimum solution, R. A. Steinberg (*Bot. Gaz., 97 (1936), No. 3, pp. 666–671*).—The author believes it to be obvious that in the experiments herein reported the formation of translucent and watery hyphae in the absence of sulfur is a morphological abnormality due to nutrient deficiency. Other data on hand afford proof that a deficiency of nitrogen, phosphorus, magnesium, iron, or zinc also leads to similar results. It may be concluded therefore that the morphological characteristics of the control or so-called "unstimulated", "normal", or minus zinc culture usually obtained in zinc stimulation studies are really the abnormal, whereas those of the "stimulated", or zinc culture, are actually the normal. The barium effect within the range studied is due to the removal of sulfur.

Nyctalis parasitica and N. asterophora in culture, G. E. Thompson (*Mycologia, 28 (1936), No. 3, pp. 222–227, figs. 21*).—This contribution from Cornell University describes the developmental stages of the two fungi in culture. Corn meal, oatmeal, and potato dextrose provided suitable media for *N. parasitica*, and the first two for *N. asterophora*.

The genus Underwoodia, H. A. Nüsslé (*Mycologia, 28 (1936), No. 3, pp. 236–240, fig. 1*).—In this contribution by Cornell University, the literature of this Discomycete genus containing the single species *U. columnaris* is briefly reviewed, with notes on a specimen recently collected at Ithaca, N. Y.

Cytological study of the germination of the chlamydospore in Urocystis tritici [trans. title], A. Biraghi (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat., e Nat., 20 (1934), No. 9, pp. 343–346*).—Spores of *U. tritici* germinate, producing a promycelium of variable length on which from two to five sporidia appear, the most frequent number being three. The young promycelium has a single nucleus that soon divides, generally giving rise to four nuclei that pass one into each sporidium. When the number of sporidia is smaller than the number of the nuclei of the promycelium, the surplus remain in the promycelium. The dikaryophase is preceded by conjugation between two sporidia or between a sporidium and the promycelium. A fusion tube is always formed, and through it a nucleus passes into one of the sporidia, which begins to elongate, and a binucleate hypha is thus produced. The sporidium from which the nucleus has migrated soon degenerates, as does the promycelium.—(*Courtesy Biol. Abs.*)

A Cretaceous fungus: Xylomites cycadeoideae, M. A. Chrysler and C. M. Haenseler (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 33–36, figs. 7*).—In this con-

tribution by the New Jersey Experiment Stations, a well-preserved, sterile fungus is described as a new species from the leaf bases of a Cretaceous cycadeoid from claypits at Woodbridge, N. J.

The nodules of different varieties, percentage of nitrogen in legumes, and their influence on the nitrogen economy of the soil, G. Bjälfve (*K. Landtbr. Akad. Handl. och Tidskr., 74 (1935), No. 7, pp. 963–997, figs. 15; Eng. abs., pp. 995, 996*).—The root nodules were studied (1932–34) on pure lines of the Monopolärt and Soloärt varieties of field peas grown in pot cultures of (1) quartz sand without nitrogen, (2) of soil rich in nitrogen, and (3) on plats in mineral soil not too rich in nitrogen.

On the basis of the results obtained here and those previously reported with vetch (E. S. R., 72, p. 317), the author believes that the formation and localization of nodules vary with different pure lines, that within a pure line their formation and localization vary according to the amount of easily available nitrogen in the soil, the aeration, and other conditions, and that varieties with comparatively poor nodule formation have a considerable need for easily available nitrogen while those with abundant nodules grow excellently through nitrogen fixation only.

It appears from analyses that legumes may vary considerably in nitrogen content, yet these differences do not seem to be related to differences in the reaction of the medium. Field peas grown under favorable conditions in media low or lacking in nitrogen enriched the medium with fixed nitrogen. This is believed to occur through the decay of rootlets, and this part of the nitrogen fixed probably amounts to from 15 to 30 percent of that fixed in the tops. The nitrogen in the roots of peas consisted of at least 25 percent of water-soluble compounds, a large part of which may leach out into the soil under suitable conditions and become available to other plants. When legumes were grown in media containing large amounts of easily available nitrogen, they took up a large proportion and thus reduced the quantity available to nonlegumes. Studies of the relative efficiency of the nodules on different varieties should therefore be made with nitrogen-poor soil or media. The results with nitrogen-rich soil indicate only the ability of the different varieties to utilize easily available nitrogenous compounds.

The action of sodium nitrate upon the infection of lucerne root-hairs by nodule bacteria, H. G. Thornton (*Roy. Soc. [London], Proc., Ser. B, 119 (1936), No. 815, pp. 474–492, pls. 2, figs. 5*).—The actions of living nodule bacteria and of their sterile filtrates were tested on root hairs of alfalfa grown in agar medium in the presence and absence of sodium nitrate ($NaNO_3$) and ammonium sulfate $(NH_4)_2SO_4$. At initial concentrations of from 0.1 to 1 percent, $NaNO_3$ prevented infection of the root hairs. Deformation of the root hairs by the nodule bacteria was also checked by $NaNO_3$ at the above concentrations and by $(NH_4)_2SO_4$ at 0.1 percent. This deformation being a necessary prelude to infection, its inhibition accounted for the absence of infection in the cases cited. At 0.1 percent, $NaNO_3$ checked the deformation of root hairs by sterile filtrates of nodule bacteria. Both the living bacteria and their sterile filtrates not only caused deformed growth of the root hairs, but also stimulated an increase in their number and length. This growth stimulation was also checked by $NaNO_3$.

These effects of nitrate in inhibiting the action of the bacterial secretions on the root hairs were mitigated by the addition of dextrose, together with the nitrate, to the medium surrounding the roots, suggesting that nitrate interferes with the carbohydrate supply to the piliferous layer of the root.

Reduction of nitrates to nitrites by the expressed juice of higher green plants, A. L. Sommer (*Plant Physiol., 11 (1936), No. 2, pp. 429–436*).—In stud-

ies at the Alabama Polytechnic Institute, "a large number of nitrite determinations on mixtures of nitrate, glucose, and expressed plant juices to which toluene had been added and maintained at sufficient concentration to prevent the action of micro-organisms failed to indicate the presence of substances in the green plant which cause catalytic reduction of nitrate to nitrite in the absence of light."

Analytic studies in plant respiration.—VI, The relation of the respiration of potatoes to the concentration of sugars and to the accumulation of a depressant at low temperatures: Pt. 3, The relation of the respiration to the concentration of sucrose, J. BARKER (*Roy. Soc. [London], Proc., Ser. B, 119 (1936), No. 815, pp. 453–473, figs. 10*).—In the preceding parts[1] the concentration of total sugars was provisionally adopted as a measure of the respirable substrate. Here, evidence is presented as showing "that the forms of the respiration/glucose, respiration/fructose, and respiration/total sugar relations vary over a wide range according to the changes of the sucrose/hexose quotient during sweetening and desweetening. On the other hand, the respiration/sucrose relation both during sweetening and desweetening, and also while the sucrose/hexose quotient was either increasing or decreasing, conformed closely with the enzymatic rectangular hyperbola for the rate of reaction/substrate relation for an enzyme reaction in vitro. There is thus strong evidence that sucrose is closely related to the substrate supply for respiration and that neither glucose nor fructose is directly associated with this function. The bearing of the above observations on our knowledge of the nature of the respirable substrate is discussed. In samples of low sugar content the sucrose/hexose quotient is shown to be markedly affected by changes of temperature."

The role of potassium in plant nutrition, W. L. POWERS (*Better Crops With Plant Food, 20 (1936), No. 10, pp. 6–8, 34, 35, figs. 3*).—In this contribution from the Oregon Experiment Station, a brief general discussion is given of the plant potassium relations of various soil types and the factors influencing these relations, including a review of some of the physiological effects of potash applications to specific plant species as reported by various workers and especially with reference to experiments in Oregon on flax, mint, and potatoes. Brief reference is also made to some studies of various potash carriers and of rates of application.

Raising the physiological combustion in the presence of potassium and phosphorus in the cells, and the prevention of freezing in plants [trans. title], J. STOKLASA and B. HAVLÍNOVÁ (*Sborn. Českoslov. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 10 (1935), No. 4, pp. 457–469; Ger. abs., p. 469*).—The authors review various studies and theories regarding the basic causes of death from low temperatures in plants, and report data showing that low temperature alone is not its cause, but that the decisive factor is the amount of water which in freezing is removed by the change into ice.

Radium irradiation affects plants by inducing changes in the protoplasm whereby presumably the general cell functions and above all the vitality of the organism are heightened, and thus the cells are rendered more resistant to the freezing process.

According to the authors' 50 yr. of observation and experimentation in the field and greenhouse with plants (especially sugar beets) grown in soils deficient in assimilable potassium (K) and phosphorus (P), unfavorable weather has been prone to induce root necrosis and freezing injury. The ash of plants so grown was also deficient in K, P, and sodium (Na). Furthermore, barley, wheat,

[1] Roy. Soc. [London], Proc., Ser. B, 112 (1933), No. B 777, pp. 316–358, figs. 11.

rye, sugar beets, and potatoes grown in soils fertilized with P, K, and Na were not so readily frozen as those grown in soils deficient in these elements.

On the basis of these data the authors are convinced that in the absence of *sufficient P, K, and Na ions the respiratory process is unable to take place with* normal efficiency, and the physiological combustion undergoes a depression which with unfavorable weather conditions (especially with insufficient oxygen in the soil, together with abnormal cold) leads to freezing. On the other hand, if air and P, K, and Na ions are present in sufficient amounts in the cytoplasm and karyoplasm, freezing (especially of tender seedlings) is prevented.

Comparative boron content of plants grown on the same soil [trans. title], G. Bertrand and H. L. de Waal (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 8, pp. 321–324*).—The boron content of 30 species of plants growing on the same soil was determined by the colorimetric and volumetric methods. The unequal power of the different species to fix boron was striking, ranging from 2.3 mg per kilogram dry weight in barley, rye, wheat, and maize to 94.7 mg in the poppy. There appeared to be some relation between the boron-fixing capacity of a plant and its systematic position.

The physiological and agricultural significance of the findings are briefly discussed, particularly in relation to boron poisoning in certain plants and boron deficiency in others.

Distribution of acetaldehyde and alcohol in the apple fruit, E. V. Miller (*Jour. Agr. Res.* [U. S.], *53 (1936), No. 1, pp. 49–55*).—The acetaldehyde and alcohol contents of Jonathan apples were higher in the peel than in the pulp or core, and in the peel of soft-scalded than in that of normal apples. Rinsing in ether removed 16.3 percent of the total ether extract of the peel, the latter in this way also losing 36.7 percent of its original acetaldehyde. The acetaldehyde content of normal Grimes Golden apples was higher in the peel than in the pulp or core, and in the peel of apples with soggy break-down than in that of normal fruits. Samples of peel, pulp, and core prepared for analysis but held in closed flasks in the refrigerator for 4 hr. accumulated from two to four times their original amounts of acetaldehyde. Finely ground pulp of normal Grimes Golden apples yielded more acetaldehyde than coarsely sliced pulp but not so much as the peel. Frozen Grimes Golden apples sampled 4 hr. after freezing showed no more acetaldehyde than normal apples, but when held 24 hr. in the laboratory after freezing the acetaldehyde content was over three times as great in frozen as in normal apples.

Apparently a high acetaldehyde content in apple peels may be due in part to its production by cells ruptured in paring, but there is also a tendency for it to accumulate in peels affected either by mechanical injuries to the cells or by abnormal physiological conditions of the fruits.

Distribution of total soluble solids and catalase in different parts of Jonathan apples, P. L. Harding (*Jour. Agr. Res.* [U. S.], *53 (1936), No. 1, pp. 43–48, figs. 2*).—"Specific differences in total soluble solids and catalase activity were found in different parts of Jonathan apples. Soluble solids were consistently lower in apples affected with soft scald than in those not affected, but in both cases the greatest concentration was found in the skin, with a gradual decrease toward the pith. In normal apples, catalase activity was highest in the skin and least in the region immediately beneath the skin. In apples showing soft scald, catalase activity was highest in the pith region and lowest in the diseased portion comprising the skin and the brown tissue immediately beneath it.

"The results of this investigation suggest that preliminary work to determine localized differences in different parts of an apple should precede chemical or physiological studies in which the fruit is customarily analyzed as a whole.

This procedure might lead to a modification of methods of sampling and give quite different and more significant results."

The growth hormone in the base of the oat coleoptile [trans. title], H. SÖDING (*Ber. Deut. Bot. Gesell., 53 (1935), No. 10, pp. 843–846*).—Small amounts of growth hormone in the coleoptile base were demonstrated by diffusion into agar.

The influence of crystallized hormones on the growth of certain species of yeasts [trans. title], A. P. WEBER (*Compt. Rend. Acad. Sci. [Paris], 202 (1936), No. 6, pp. 517–519*).—The author tested the effects of folliculin, benzoate of dihydrofolliculin, and heteroauxin on eight species of yeasts, in most cases with no effect on the production of dry matter. With the first two hormones, however, the production of dry matter by two species was markedly increased, and with the heteroauxin growth was inhibited in one species.

Effect of auxins from some green algae upon Phytophthora cactorum, L. H. LEONIAN (*Bot. Gaz., 97 (1936), No. 4, pp. 854–859, figs. 2*).—Four pure cultures of unicellular green algae (*Chlorella viscosa, Coccomyxa simplex, Oocystis naegelii,* and *Scenedesmus flavescens*) were used in this study at the West Virginia Experiment Station, and the first two, especially, exhibited a marked stimulation by the growth-promoting substances extracted from garden peas. These algae also retained their green color in the presence of these substances, but in their absence it gradually faded into a yellowish tone.

All four of the algae formed growth- and sexuality-promoting factors for *P. cactorum.*

The effect of auxin on the abscission of petioles, C. D. LA RUE (*Natl. Acad. Sci. Proc., 22 (1936), No. 5, pp. 254–259*).—Except in strong light, auxin and synthetic heteroauxin delayed abscission when placed at the petiole end where blades were cut off from *Coleus* and *Ricinus* leaves.

Ion action and water permeability: A contribution to the coacervation theory of the plasma membranes [trans. title], I. DE HAAN (*Protoplasma, 24 (1935), No. 2, pp. 186–197, fig. 1*).—In weak concentrations, salts with a polyvalent cation lowered the water permeability of protoplasm, thus increasing its viscosity, but in higher concentrations they increased the permeability. At all concentrations tried a salt with a monovalent cation ($NaNO_3$) caused an increase in permeability. It is believed that these salt effects may be best explained by the theory that an autocomplex system of phosphatides takes part in the structure of protoplasm or its superficial layers.

Preliminary researches on the relations between water content and latent life in seeds [trans. title], L. MONTEMARTINI (*R. Ist. Bot. Palermo Lav., 6 (1935), pp. 156–165*).—This is a review of recent pertinent investigations by others and a report of the author's preliminary study with seeds of *Cicer arietinum.*

Normal viability of seeds and bacterial spores after exposure to temperatures near the absolute zero, C. B. LIPMAN (*Plant Physiol., 11 (1936), No. 1, pp. 201–205, figs. 3*).—Seeds of species of several higher plants and a variety of bacterial spores, after drying thoroughly over H_2SO_4, were exposed in the low temperature apparatus of W. F. Giauque of the University of California for more than 44 hr. to temperatures ranking from 1.3° to 4.2° K. After such exposure, both seeds and spores were perfectly viable as compared with controls. Moreover, plants were grown from seed to maturity alongside of control seeds.—(*Courtesy Biol. Abs.*)

The influence of disinfectants on the enzyme processes of germinating wheat seeds [trans. title], K. I. STRACHITSKIĬ (STRATSCHITZKY) and E. P. SUSSKIĬ (SUSSKY) (*Trudy Nauch. Inst. Udobr. i Insektofungisid. (Trans. Sci.*

Inst. Fert. and Insectofungicides [*Moskva*]), *No. 123* (*1935*), *pp. 277–282, fig. 1; Ger. abs., p. 281*).—It was shown by this study that disinfectants influence the activity of the enzymes (amylase, catalase, peroxidase, and protease) in germinating seeds. The strength of this effect on the enzymes may be used as a measure of the relative toxicity of the disinfectants. The data obtained in this way accorded with the usual criteria of the influence of disinfectants on plant growth.

Development of the embryo sac of Lilium henryi, D. C. COOPER (*Natl. Acad. Sci. Proc., 20* (*1934*), *No. 3, pp. 163–166, figs. 6*).—In this study from the Wisconsin Experiment Station it is shown that the development of the embryo sac in *L. henryi* and three other *Lilium* spp. differs from the so-called lily type.

Hydrotropic responses of roots in soil, W. E. LOOMIS and L. M. EWAN (*Bot. Gaz., 97* (*1936*), *No. 4, pp. 728–743, figs. 4*).—In a large number of experiments at the Iowa State College, 7,763 seedlings of 29 genera and 14 families were grown to determine the hydrotropic responses of their primary roots under a steep soil-moisture gradient obtained by placing in contact a soil layer with a moisture percentage below the hygroscopic coefficient and a layer with a moisture percentage slightly below the moisture equivalent or field coefficient. Under these conditions growth in the moist soil was normal and a sharp moist-dry line between the two soil layers was maintained for from 1 to 2 weeks, but growth was completely checked in roots penetrating more than about 1 cm into the dry soil.

The primary roots of many species showed no tendency to bend when growing from the moist soil layer into the dry soil, their typical response being growth along the lines determined by seed position and normal response to gravity until the root has grown into the dry soil. A second group showed weak hydrotropic responses, and a third and smaller group of plants exhibited responses in soil comparable with the results in the air, with from one-half to three-fourths of the roots following the moist soil at an angle of 45° and another fraction bending toward the moisture but not following the 45° line. Secondary roots as a group gave no clear-cut hydrotropic response in any of these tests.

The data are believed to indicate that hydrotropism in roots is by no means comparable in distribution and intensity of reaction with geotropism in roots and stems or with phototropism in stems. The results with some species of the Cucurbitaceae and Leguminosae suggested that hydrotropic responses may depend on a genetic factor present in some species or varieties but absent from closely related ones.

The possibility of a response in soil similar to that obtained in air is indicated, but the results show equally clearly that hydrotropism is not a universal, and probably under field conditions not a common, plant response.

Diurnal fluctuations in transpiration during the course of the season in the Mediterranean climate [trans. title], F. BRUNO (*R. Ist. Bot. Palermo Lav., 6* (*1935*), *pp. 1–91, pls. 6, figs. 2*).—Data are included for 19 plant species.

A macro-respirometer for the study of aerobic bacterial dissimilation, H. G. WOOD, C. ERB, and C. H. WERKMAN (*Iowa State Col. Jour. Sci., 10* (*1936*), *No. 3, pp. 295–301, pl. 1, fig. 1*).—In this contribution by Iowa State College, a macrorespirometer is described and illustrated which permits determination of oxygen consumed, CO_2 produced, and the nongaseous products of dissimilation by resting or proliferating cell suspensions. Oxidation-reduction balances may be calculated for aerobic as well as for anaerobic dissimilations.

GENETICS

Papers read at recent meetings of the Genetics Society of America, P. W. WHITING (*Amer. Nat., 70* (*1936*), *No. 726, pp. 36, 37, 38–40, 42, 43, 44–46, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 60–62, 62–64, 64–67, 68, 69, 70, 71, 72, 73*).—

Abstracts of the following papers of agricultural interest presented at the Woods Hole, St. Louis, and Princeton meetings are included:

A Genetic Factor for the Annual Habit in Beets (*Beta vulgaris* L.) and Linkage Relationship and A Genetic Factor for Curly-Top Disease Resistance in Beets (*Beta vulgaris* L.) and Linkage Relationships, both by F. A. Abegg and F. V. Owen (p. 36); Visible Mutations From Aged Seeds, by A. G. Avery and A. F. Blakeslee (pp. 36, 37); Studies on the Inheritance of Resistance to Wilt *Fusarium niveum* (E. F. S.) in Watermelons, by L. S. Bennett (pp. 38, 39); A Gene for Compound Pollen Grains in *Datura*, by A. D. Bergner, J. L. Cartledge, S. Satina, and A. F. Blakeslee (p. 39); The Distribution of Black and Red Pigment in Cattle Hairs, by R. Bogart and H. L. Ibsen (pp. 39, 40); The Induction of Triploidy Through Hybridization, by W. H. Brittingham and G. H. Shull (p. 42); Genes Affecting Pollen-Tube Growth in *Datura*, by J. T. Buchholz and A. F. Blakeslee (pp. 42, 43); Temperature as a Factor in the Increased Mutation Rate, by J. L. Cartledge, L. C. Barton, and A. F. Blakeslee (p. 43); Chromosome Configurations in Some New Oenotheras, by R. E. Cleland and B. L. Hammond (p. 44); Origin and Nature of Tetraploid Pineapples, by J. L. Collins and K. R. Kerns (p. 45); A Study of the Influence of the Genetic Constitution of the Host on the Growth of Cysticercus Sarcoma 146 and the Jensen Rat Sarcoma, by M. R. Curtis, W. F. Dunning, and F. D. Bullock (pp. 45, 46); Genetics of Sex Differences in Plumage (*Syrmaticus reevesi*), by C. H. Danforth (p. 46); Variation of the Branches of the Aortic Arch in Rabbits, by H. W. Edmonds and P. B. Sawin (pp. 48, 49); Inheritance of Doubleness in *Tropaeolum majus* and Revised Linkage Maps of Chromosomes 5 and 9 in Maize, both by W. H. Eyster (p. 49); Genetic Variations in a Commercial Field of Maize, by W. H. and H. C. Eyster (p. 49); Genetic Studies of *Tropaeolum*, by W. H. Eyster and B. A. Robinson (p. 49); Has Selection Creative Power? by H. D. Goodale (p. 50); The Production of Spontaneous Melanotic Neoplasms With a Single Type of Melanophore in Hybrid Fishes (pp. 50, 51) and The Production of Spontaneous Melanotic Neoplasms at Birth in Hybrid Fishes (p. 51), both by M. Gordon; On the Quantitative Aspects of Disease, by J. W. Gowen (p. 51); Virescent Seedling Linked With Japonica in Group 8, by H. K. Hayes (p. 52); A Three-Factor Autosomal Linkage Group in the Pigeon, by W. F. Hollander (p. 53); Necrotic Response to Tobacco-Mosaic Infection in Paniculata-like Segregates From *Nicotiana paniculata* × *rustica*, by F. O. Holmes (p. 53); Atypical Growths in Maize Occurring as Mosaics, by D. F. Jones (p. 54); Mouse Strains and Susceptibility to Tumors Induced by 1:2:5:6-Dibenzanthracene, by C. J. Lynch (p. 55); A Translocation to the Sex-Chromosome in *Apotettix eurycephalus* Hancock (Grouse Locusts), by R. K. Nabours and F. M. Stebbins (pp. 57, 58); Self-Fertility and Self-Sterility in Beets, by F. V. Owen (pp. 58, 59); Interaction of Host and Normal Tissue Transplants as Indicated by Response to Leukemic Cells, by J. S. Potter, E. C. MacDowell, and M. J. Taylor (pp. 60, 61); Morphology and Cytology of a Gynandromorph of *Paratettix texanus* (p. 61) and The Chromosomes of Nabours and Stebbins's Sex-Linked Translocation in *Apotettix eurycephalus* (pp. 61, 62), both by W. R. B. Robertson; Inheritance of Homeosis in the Axial Skeleton of the Rabbit, by P. B. Sawin (pp. 62, 63); Development of the Polydactylous Monster of the Guinea Pig, by J. P. Scott (pp. 63, 64); The Histological Basis of Size Differences in Some Cucurbit Fruits (pp. 64, 65) and A Simple Case of the Effect of Size Difference on the Expression of a Shape Genotype (p. 65), both by E. W. Sinnott; The Relation Between Factors Affecting Color and Size in Certain Species of *Nicotiana*, by H. H. Smith (pp. 65, 66); Cytogenetic Studies of *Triticum monococcum* and *T. aegilopoides*, by L. Smith (pp. 66, 67);

Biochemical Studies Relating to the Waxy Gene in Maize, by W. K. Smith (p. 68); ***Genetic Effects of Ultra-Violet Radiation in Maize***, by L. J. Stadler and G. F. Sprague (p. 69); **A Quantitative Study of the Pigments in the Basic Color Types of the Domestic Pigeon**, by D. G. Steele and I. R. Miller (p. 69); **Inheritance and Correlation of Shape, Size, and Color in the Watermelon**, by L. M. Weetman (pp. 70, 71); **Selection for Virulence in *Bacterium stewartii* (Smith) Migula by Repeated Passage Through Resistant and Susceptible Inbred Lines of Maize**, by E. J. Wellhausen (pp. 71, 72); and **The Action of Male and Female Hormones Upon the Reproductive Glands and Ducts of the Chick Embryo**, by B. H. Willier, T. F. Gallagher, and F. C. Koch (pp. 72, 73).

A glossary of genetic terms (*U. S. Dept. Agr. Yearbook 1936, pp. 153–164*).—Definitions are given of genetic terms, including especially those used in the genetics articles in the Yearbook.

Heredity under the microscope, J. H. Kempton (*U. S. Dept. Agr. Yearbook 1936, pp. 165–182, figs. 18*).—This popular exposition of cytology gives a general view of the structure of the cell, describes the formation of germ cells as seen under the microscope as exemplified by corn, lists the number of chromosomes in different animals and crop plants, and speculates on how the mechanical processes in the cell are controlled.

Better plants and animals, G. Hambidge and E. N. Bressman (*U. S. Dept. Agr. Yearbook 1936, pp. 119–152*).—This foreword discusses the development of the science of genetics and the survey of plant and animal improvement suggested by the Secretary of Agriculture and made in cooperation with the State experiment stations and other agencies; comments on the technic of plant and animal breeding; and briefly summarizes the articles in the Yearbook which deal with specific crops and classes of livestock.

Cytological studies in the Gramineae, G. L. Church (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 12–15, figs. 16*).—"As an aid to the interpretation of taxonomic instability, irregularities of microsporogenesis, sterility, and polyploidy have been cited in certain species of grasses as indications of genetic impurity. Thus, *Agrostis maritima*, *Poa pratensis*, *Spartina patens*, and *Andropogon scoparius* var. *frequens* have been shown to be meiotically irregular and highly polyploid, whereas the supposedly variable *Agrostis pratensis*, *Festuca ovina* var. *capillata*, *F. elatior* var. *pratensis*, *S. patens* var. *juncea*, and *Andropogon scoparius* var. *villosissimus* have been found to be cytologically normal and either diploid or tetraploid."

***Chromosome numbers in Dolichos lablab* (Linn.) and (Roxb.)**, G. N. R. Ayyangar and N. Krishnaswamy (*Cur. Sci. [India], 4 (1936), No. 10, p. 739*).—The $2n=24$, the same as reported for *D. biflorus* and *D. multiflorus*.

The occurrence and inheritance of yellow coloured anthers in the Italian millet—Setaria italica (Beauv.), G. N. R. Ayyangar and P. V. Hariharan (*Madras Agr. Jour., 24 (1936), No. 4, pp. 151, 152*).—Yellow anthers (drying brown), in *S. italica* (E. S. R., 68, p. 34) from India, Russia, and China, were found to be dominant to white anthers and recessive to brownish-orange anthers in ratios approximating 3:1.

The origin of fatuoid oats with particular reference to a hybridization theory, L. P. Johnson (*Northwest Sci., 10 (1936), No. 2, pp. 16–24, fig. 1*).—This paper summarizes and simplifies an earlier article by Aamodt, Johnson, and Manson (E. S. R., 72, p. 599).

Hybrid selections of oats resistant to smuts and rusts, H. C. Murphy, T. R. Stanton, and F. A. Coffman (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 370–373, fig. 1*).—As a result of breeding work by the Iowa Experiment Station, the crosses producing the most promising lines, homozygous not only for re-

sistance to rusts and smuts but also apparently desirable from agronomic standpoints, were Bond×Iogold, Anthony×Bond, Bond×Iowa No. D69, and Green Russian sel.×Bond. Since the resistant selections reported were subjected in both greenhouse and field to epiphytotics of rust and smut much more severe than those ordinarily experienced, it is believed that they will continue to be resistant under natural epiphytotics unless some major change occurs in the physiologic-form flora of the Corn Belt region.

Inheritance of glume length in ragi, Eleusine coracana (Gaertn.), the finger millet, G. N. R. AYYANGAR and U. A. WARIAR (*Madras Agr. Jour., 24 (1936), No. 4, pp. 132–134, pl. 1*).—The short glume length in a normal cultivated ragi seemed due to the presence of three dominant factors Gl_1, Gl_2, and Gl_3 functioning as inhibitors. Any two elongate the glume and give a medium length, while each of them alone or none give the long glume. Their interplay results in the ratio of 27 short : 27 medium : 10 long glumes.

Studies in Indian pulses: The inheritance of morphological characters and of wilt-resistance in rahar (Cajanus indicus Spreng.), F. J. F. SHAW (*Indian Jour. Agr. Sci., 6 (1936), No. 2, pp. 139–187, pls. 4*).—This number in the series previously noted (E. S. R., 71, p. 187) describes the inheritance of certain morphological characters and wilt resistance in a cross between Pusa types 5 and 80 unit species of pigeonpea.

The inheritance of flower color followed a 9 : 3 : 3 : 1 ratio, the F_1 and double recessive being new phenotypes unlike the yellow of type 5 or the yellow with diffused red on dorsal side of standard of type 80. Erect growth was dominant (partially) to spreading habit, short stature dominant to tall, crowded inflorescence dominant to the open, and the brown seed of type 80 dominant to the silver white of type 5, all on 3 : 1 ratios. When grown in wilt-infected fields, the loss due to wilt in F_2 suggested that inheritance of resistance may be found in a 9 : 7 or 27 : 37 ratio, resistance being dominant. Inheritance of resistance was not found linked with that of any morphological character. Phenotypes with resistance to wilt and most of the morphological characters of the susceptible parent were isolated from the cross. Morphologically identical hybrids differed widely in behavior to wilt from almost complete resistance to complete susceptibility. See also another note (E. S. R., 71, p. 656).

Chromosome numbers in sorghum, R. E. KARPER and A. T. CHISHOLM (*Amer. Jour. Bot., 23 (1936), No. 5, pp. 369–374, figs. 14*).—The meiotic and somatic chromosome numbers in important cultivated species and varieties of sorghum and in wild grass sorghum species are reported from studies at the Texas Experiment Station.

The somatic chromosome number is 10 in *S. versicolor*, 20 in *S. sudanensis*, and 40 in *S. halepensis*. The chromosomes in *S. versicolor* are about twice as large as those in *S. vulgare*, and most of the chromosomes in *S. halepensis* are smaller than those in *S. vulgare;* the average lengths of the chromosomes in similarly prepared root tips were 4.86μ, 2.24μ, and 1.98μ, respectively, in the 3 species. All of the commercially important cultivated American species and varieties of grain sorghums, forage sorghums, broomcorn, and grass sorghums have 20 somatic chromosomes. *Andropogon annulatus* has 40. F_1 of *S. vulgare*×*S. halepensis* has 30 somatic chromosomes. In meiosis of this hybrid, triploid, univalent, bivalent, and quadrivalent chromosome associations were found.

Inheritance of characters in sorghum—the great millet, VII, VIII (*Indian Jour. Agr. Sci., 5 (1935), No. 4, pp. 539–541, pl. 1; 6 (1936), No. 2, pp. 481–483, pl. 1*).—The series (E. S. R., 71, p. 457) is continued.

VII. *Ligule and auricle*, G. N. R. Ayyangar, V. P. Rao, and A. Kunhikoran Nambiar.—A liguleless and nonauriculate condition (*lg*) of the leaves, found

in Sudan grass and in broomcorn, behaved as a simple recessive to the normal (*Lg*) ligulate and auriculate condition.

VIII. *A brownish purple mutant*, G. N. R. Ayyangar and A. Kunhikoran Nambiar.—A mutant sorghum with brownish purple-lined internode, leaf sheath, midrib, panicle branch, and glume top behaved as a simple recessive to the common green internode and white midrib plant. A factor mt_B gives a mechanical tissue colored brownish purple, whereas Mt_B results in the ordinary green internode of common sorghums.

Inheritance of complementary dwarfing factors in wheat, V. H. Florell and J. F. Martin (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 2, pp. 151–160, fig. 1*).—Dwarfs occurred in the F_1 generation in crosses between normal (tall) varieties of wheat in cooperative studies by the Idaho Experiment Station and the U. S. Department of Agriculture.

In 1931 Turkey-Florence was crossed with Jenkin, Federation, and Baart, and Hussar-Hohenheimer was crossed with Jenkin, and in 1932 both Turkey-Florence and Hussar-Hohenheimer were crossed with two selections of Arco. F_1 dwarf plants averaged from 15 to 17 in. in height and the normal parents from 33 to 44 in. The weight of kernel of F_1 dwarf plants averaged less than that of the parents. Segregation of dwarf and normal plants was studied in the F_2 and F_3 generations in the crosses made in 1931. Winter-killing caused considerable loss of F_2, especially among the dwarfs. The number of normal plants, based on a three-factor difference and a ratio of 39 dwarf to 25 normal was close to the expected in one F_2 cross (Turkey-Florence × Baart). The expected ratio of true breeding to segregating families from both normal and dwarf F_2 plants was verified by F_3 results.

Dwarf F_1 plants from crosses between normal varieties indicated complementary factors, the results being explained by assuming a second dwarfing factor, *E*, which, with the established *D* factor, is dominant over *I*. *E* alone, unlike *D*, cannot produce dwarfs in the absence of *I*. The genotype of Turkey-Florence and Hussar-Hohenheimer, accordingly, is *iiddEE*, and that of the other varieties involved *IIDDee*.

Induced polyploidy in wheat and rye: Chromosome doubling in Triticum, Secale, and Triticum-Secale hybrids produced by temperature changes, E. Dorsey (*Jour. Heredity*, *27* (*1936*), *No. 4, pp. 154–160, figs. 4*).—Polyploids induced at Cornell University by an adaptation of the method of Randolph (E. S. R., 69, p. 40) included tetraploids in *T. durum*, *T. polonicum*, *T. vulgare*, *T. vulgare* × *T. compactum*, and *S. cereale*, and a wheat-rye amphidiploid.

Chromosome numbers and species characters in Yucca, G. M. Watkins (*Amer. Jour. Bot.*, *23* (*1936*), *No. 5, pp. 328–333, figs. 15*).—Equatorial plate figures of meiotic divisions of microsporogenesis in *Y. aloifolia*, *Y. filamentosa*, *Y. louisianensis*, and *Y. radiosa* (*Y. elata*) showed 30 chromosomes, 5 of which are long and 25 very short, and equatorial plates in root tips of *Y. arkansana* and *Y. glauca* showed 60 chromosomes, with 10 long and 50 short. Usually the long chromosomes tended to occupy a radial, peripheral position in the figure, while the short chromosomes lie more toward the center.

Although *Yucca* species range in size from small acaulescent forms to trees 8–10 m high, this increase in plant size is not attributable to polyploidy, since so far only diploid plants have been found within the group. The average length of bivalent chromosomes of *Y. aloifolia*, a small tree 2–3 m high, is about 1.3 times that of the bivalents of *Y. louisianensis*, an acaulescent species.

The relationship of chromosome numbers and karyotypes to the taxonomy of the Dracaenoideae and the Agavoideae is discussed, with pertinent references.

Inbreeding and heterosis in the grape [trans. title], A. M. NEGRUL (*Züchter, 8 (1936), No. 6, pp. 137–145, figs. 8*).—Observations on about 3,000 seedlings obtained through the inbreeding of European varieties show in general no sharp differences in growth between inbred and crossbred seedlings of *Vitis vinifera*. A comparison between inbreds and hybrids between species did show considerable differences which are ascribed to heterosis in the wide crosses. The author concludes that the varieties of *V. vinifera* are heterozygous to varying degrees and have in some cases different recessive characters. It is, therefore, deemed wrong to draw general conclusions concerning lower germination, weak growth, and delayed fruiting in comparing hybrid seedlings. It is considered incorrect to assume that inbreeding is an improper method of developing new varieties, although admittedly inbreeding has much less significance than crossing. The hybridization of species with resulting heterosis has peculiar significance in the development of understocks. In the F_1 of interspecific hybrids, there takes place a motley segregation with various combinations of characters. These hybrids offer an insight into the origin of cultivated varieties of grapes and also afford a means of developing genetic classifications of varieties.

Livestock breeding at the crossroads (*U. S. Dept. Agr. Yearbook 1936, pp. 831–862, figs. 9*).—A general statement regarding the survey of germ plasm in livestock, discussing the status of livestock breeding and needs of the future.

Unusual possibilities in [livestock] breeding (*U. S. Dept. Agr. Yearbook 1936, pp. 183–193, figs. 9*).—These pages deal with the inheritance of certain unusual characteristics appearing in livestock described as chimeras and odd plumage characters in fowls, fat-tailed sheep, wide crosses in cattle, and recorded cases of fertile mules.

Adult mortality from the viewpoint of genetics, M. A. JULL (*Poultry Sci., 15 (1936), No. 3, pp. 195–198*).—This is a discussion of the increased difficulties in the breeding program encountered in attempts to breed for disease resistance and lowered mortality.

Beef and dual-purpose cattle breeding, W. H. BLACK (*U. S. Dept. Agr. Yearbook 1936, pp. 863–886, figs. 9*).—The results of the survey on the improvement in beef and dual-purpose cattle are briefly presented, together with accounts of characters on which the mode of inheritance is known and a discussion of problems needing solution.

Superior germ plasm in dairy herds, R. R. GRAVES and M. H. FOHRMAN (*U. S. Dept. Agr. Yearbook 1936, pp. 997–1141*).—The early history of dairy cattle breeding and the importance of herd testing for the selection of breeding stock are briefly discussed. Methods followed in obtaining the data on superior germ plasm and the manner of rating sires in connection with the survey are described in considerable detail. An extensive appendix includes a list of the herds supplying information for the survey, with indications of the improvement brought about by different sires in milk production and butterfat tests.

Swine—some current breeding problems, H. C. MCPHEE and O. G. HANKINS (*U. S. Dept. Agr. Yearbook 1936, pp. 887–905, figs. 7*).—The results of the cooperative survey on swine improvement indicate the data being recorded at the State experiment stations and the types of projects under way. A discussion is given of the findings in experimental work and the characters on which the mode of inheritance is known.

Woolly hair in swine, A. O. RHOAD (*Jour. Heredity, 25 (1934), No. 9, pp. 371–375, figs. 3*).—Data are presented to indicate that a woolly hair condition in swine is dominant to the normal straight hair condition and due to a single mendelian factor which is independent in inheritance of coat color, pattern,

or sex. The condition occurred in the swine herd of the Escola Superior de Agricultura e Veterinaria, Minas Geraes, Brazil.

Breeding problems with sheep, H. C. McPhee and D. A. Spencer (*U. S. Dept. Agr. Yearbook 1936, pp. 907–928, figs. 11*).—The progress made in studies of sheep-breeding problems and the research projects under way in the country are noted, together with reference to further needs in sheep breeding.

Improving horses and mules, J. O. Williams and W. Jackson (*U. S. Dept. Agr. Yearbook 1936, pp. 929–946, figs. 6*).—The present status and anticipated needs of research in horse breeding are discussed.

Superior breeding stock in poultry, M. A. Jull (*U. S. Dept. Agr. Yearbook 1936, pp. 947–995, figs. 15*).—The present status of poultry breeding research and characters in poultry whose mode of inheritance are known are described. Special attention is given to production of superior breeding stock through selection based on egg production, pedigree, and progeny performance.

Further experiments with the p gene in the fowl, J. P. Quinn (*Jour. Genet., 30 (1935), No. 3, pp. 477–480, pl. 1*).—From a study of the results of crossing Red Splashed Whites (*p*) (E. S. R., 71, p. 614) with Light Sussex and Jersey Black Giant fowls at the U. S. D. A. Beltsville Research Center, it is concluded that the *pp* genes suppress the columbian pattern and black color, except in the latter case for a black spot on the head.

The inheritance of skeletal dimensions in the domestic fowl, A. J. G. Maw (*Sci. Agr., 16 (1935), No. 2, pp. 85–112, pl. 1, figs. 18; Fr. abs., p. 112*).—Results are reported of studies from the Wisconsin Experiment Station of the skeletal dimensions of Golden Sebright Bantams and Light Brahmas and the F_1 and F_2 crosses beteween them. The F_1s and F_2s were slightly smaller than the average between the parental breeds. The F_1 females sired by the Brahma male showed significantly longer leg and wing bones than the females of the reciprocal cross, indicating sex linkage of size genes. There was no association of shank color or comb type genes with size, although plumage color and rate of tail feathering were linked. Evidently a sex-linked factor was introduced into the cross, which reduced the size of the skeletal dimensions. Correlation coefficients above 0.9 were found between the skeletal measurements of the F_2s, although they were considerably lower between the skeletal measurements and the cranial measurements.

The color of our rabbit breeds and their histological basis [trans. title], R. Danneel (*Ztschr. Induktive Abstam. u. Vererbungslehre, 71 (1936), No. 1–2, pp. 231–264, figs. 18*).—The color characters of rabbits are discussed, and the deposition of the pigment in the hair and eyes is described from a histological study. A discussion is given of the chemistry of pigment production.

The effect of hysterectomy on the duration of life and retrogression of the corpora lutea and on secondary sex organs in the rabbit, L. Loeb and M. G. Smith (*Amer. Jour. Anat., 58 (1936), No. 1, pp. 1–25*).—Differences in the retrogression of corpora lutea, placentomata, and mammary glands and the condition of the vagina, cervix, and uterus in rabbits, with and without hysterectomy and at different ages, are noted. A comparison of the effects of hysterectomy in the guinea pig, rabbit, and rat is presented.

Fertilization of rabbit ova in vitro [trans. title], N. A. Diomidova (Diomidowa) and N. A. Kuznetsova (Kusnezowa) (*Biol. Zhur., 4 (1935), No. 2, pp. 243–250, figs. 9; Ger. abs., p. 250*).—Comparison was made of the development of fertilized and unfertilized rabbit ova in vitro. The fertilized eggs developed to a blastomere with from 8 to 10 cells, and rabbit ova fertilized by guinea pig sperm developed to the 3- to 4-cell stage.

Cytological investigations of hybrid fertilization of rabbit ova outside the organism [trans. title], O. V. Krasovskaiâ (O. W. Krassowskaja) (*Biol.*

Zhur., *4* (*1935*), *No. 2*, *pp. 263–274*, *figs. 15*; *Ger. abs.*, *pp. 273, 274*).—Tests were made of the effects of rat, guinea pig, and dog sperm on the development of rabbit ova in vitro. The most success was obtained with rat sperm, in which 75 percent of the ova so fertilized showed normal development.

Fertilization of rabbit ova outside the organism.—II, Changes in size of rabbit ova before and after fertilization [trans. title], O. V. Krasovskaía (O. W. Krassowskaja) (*Biol. Zhur.*, *4* (*1935*), *No. 2*, *pp. 251–262*, *figs. 14*; *Ger. abs.*, *p. 262*).—Data are presented on the changes in size of rabbit ova during the first few minutes after fertilization.

Sexual differences of the hypophyses and their determination by the gonads, C. A. Pfeiffer (*Amer. Jour. Anat.*, *58* (*1936*), *No. 1*, *pp. 195–225*, *pls. 2*, *figs. 14*).—Studies of the hypophyses hormone influence on the secondary sex organs of males and females castrated or implanted with other gonads at birth showed that the hypophyses of males secrete only the follicle stimulator whereas the female hypophyses secrete both follicle stimulator and luteinizer. Testis transplants suppressed the production of the luteinizing hormone and had a masculinizing effect on the clitoris of females. Different sites for gonad transplantation were compared as to the resulting effect on the secondary sex characters. Ovarian transplants into male castrates had no influence on the sex type of the hypophyses. Modifications in the sex type of the hypophyses were possible only before puberty.

A technic for anesthetizing newborn rats is described which is based on the fact that homoiothermism is not fully established.

Prolactin induces broodiness in fowl, O. Riddle, R. W. Bates, and E. L. Lahr (*Amer. Jour. Physiol.*, *111* (*1935*), *No. 2*, *pp. 352–360*).—In this study at the Station for Experimental Evolution, from the Carnegie Institution of Washington, it has been demonstrated that daily injections of prolactin have induced a broody behavior in fowls, marked by a full expression of broodiness in laying hens of the normally broody breeds and by a partial expression as indicated by clucking in both laying and nonlaying hens of nonbroody breeds, nonlaying hens of broody breeds, and in two roosters.

The prolactin retained its effectiveness after 1 hr. of heating to destroy any growth-promoting fractions. The injections of a number of other hormone-bearing substances were ineffective in producing this result. This response is evidently closely associated with other responses produced by prolactin, all closely associated with the care and feeding of the very young.

The gross action of prolactin and follicle-stimulating hormone on the mature ovary and sex accessories of fowl, R. W. Bates, E. L. Lahr, and O. Riddle (*Amer. Jour. Physiol.*, *111* (*1935*), *No. 2*, *pp. 361–368*, *fig. 1*).—In further studies on the effects of injections of the anterior pituitary hormone into fowls, it was demonstrated that prolactin and the follicle-stimulating hormone exert opposite effects on the ovary and accessory sex organs of mature hens, the former causing a marked decrease in the weight of either active or resting ovaries with a corresponding decrease in the size of the oviduct and uterus, whereas the latter produced an enormous increase in weight of the ovaries and a marked increase in size of the oviduct. The size of the comb and the space between the pubic bones also decreased with the former and increased with the latter treatment. This leads to the conclusion that the anterior pituitary produces two hormones which exert opposite effects on the mature gonads.

Relation between birth weight and litter size in multiparous mammals, E. V. Enzmann and W. J. Crozier (*Jour. Gen. Physiol.*, *18* (*1935*), *No. 6*, *pp. 791–799*, *figs. 3*).—From a study of the relation of litter size to average birth weight in mice and other rodents, it is concluded that a definite relation exists between the litter size and the total weight of the litter. This relation could

be expressed by the equation $W=N^K+C$, wherein W is the average weight of a whole newborn litter, N is litter size, and C and K are constants. There appears to be an equipartition of a limited amount of nutrition provided by the assimilating capacity of the mother.

FIELD CROPS

Exploring unusual possibilities in plant breeding (*U. S. Dept. Agr. Yearbook 1936, pp. 193–206, figs. 13*).—The possibilities mentioned include breeding new characteristics from other genera of grasses into wheat, crossing sorghum and sugarcane, crossing corn with teosinte and gama grass, low nicotine content and giantism in tobacco, hooded and smooth-awn barley, brown and green lint cotton, rice in which the panicle remains almost entirely within the leaf sheath, self-threshing flax, naked, dwarf, and multiple-flowered oats, and a double dwarf broomcorn.

[Improvement of major field crops] (*U. S. Dept. Agr. Yearbook 1936, pp. 207–830, figs. 165*).—These pages comprise the following articles: Improvement in Wheat, by J. A. Clark (pp. 207–302); Problems and Results in Barley Breeding, by H. V. Harlan and M. L. Martini (pp. 303–346); Superior Germ Plasm in Oats, by T. R. Stanton (pp. 347–414); Improvement in Rice, by J. W. Jones (pp. 415–454); Corn Improvement, by M. T. Jenkins (pp. 455–522); Sorghum Improvement, by J. H. Martin (pp. 523–560); Sugarcane: Its Origin and Improvement, by E. W. Brandes and G. B. Sartoris (pp. 561–623); Improvement of the Sugar Beet, by G. H. Coons (pp. 625–656); Plant Breeding and the Cotton Industry, by J. O. Ware (pp. 657–744); Improvement in Flax, by A. C. Dillman (pp. 745–784); and Superior Germ Plasm in Tobacco, by W. W. Garner, H. A. Allard, and E. E. Clayton (pp. 785–830).

For the specific crops indicated, the articles variously review the history and status of improvement in the United States and elsewhere; describe improvement methods and objectives; indicate varieties and strains improved by introduction, selection, or hybridization by State experiment stations, U. S. Department of Agriculture, and other agencies and individuals; consider the work and productions of breeders in foreign countries; record progress and accomplishments in genetic and cytological work with the crop; cite pertinent literature; and list recommended varieties and personnel engaged in research in different States and countries, indicating their current work and objectives.

A new method of arranging variety trials involving a large number of varieties, F. Yates (*Jour. Agr. Sci. [England], 26 (1936), No. 3, pp. 424–455, figs. 2*).—The pseudo-factorial method of arranging variety trials involving numerous varieties, here described, enables the block size to be kept small without the use of controls. Various possible types of pseudo-factorial arrangement are discussed and necessary formulae developed. Appropriate methods of computation are illustrated by numerical examples based on results of a uniformity trial on orange trees by the California Experiment Station (E. S. R., 68, p. 477). Pseudo-factorial arrangements may be more efficient than arrangements involving controls, and where considerable soil heterogeneity exists they are markedly more efficient than randomized blocks containing all the varieties. In the example chosen, gains in efficiency ranging from 26 to 57 percent were obtained.

Studies in the technique of field experiments.—IV, A study of margin effect in variety trials with cotton and wheat, J. B. Hutchinson and V. G. Panse (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 671–692, fig. 1*).—In the fourth of this series (E. S. R., 74, p. 475) data were secured from cotton trials on

light and black soils under irrigation and for wheat on black soil without irrigation.

The magnitude of the effect of margins on means was shown to depend primarily upon the extent of differences between varieties in the trial. Margin effects were similar in both crops. In almost all varieties studied the competition between varieties was less than within the same variety. The results suggested that where markedly different varieties are to be compared, one row on either side of each plat will suffice for side margins. For end margins, 3 to 4 ft. should be provided at the end of each plat to allow for effects of trampling, irregularities in planting, and possible mixing of seed. With varieties similar in habit, it seemed advantageous to dispense with margins, especially where difficulties of control in outlying experiments make simplicity essential. Here the experiment should be surrounded with guard rows of the bulk crop.

Experiments on vernalisation, G. D. H. Bell (*Jour. Agr. Sci. [England], 26 (1936), No. 1, pp. 155–171, figs. 27*).—The effects of low-temperature treatment on several varieties of wheat, barley, and oats were found to be influenced greatly by the time of planting the treated grain. Winter seeding showed the least vernalization effect, while in the spring the stimulative action became more pronounced so far as heading acceleration is concerned, as the planting was progressively later, particularly in winter varieties. Developmental studies on control and vernalized plants showed the stimulative action on early growth and growing point development in the winter varieties.

Tiller counts on control and vernalized plants of Joss, Rivett, and Yeoman winter wheat demonstrated that each variety was stimulated to earlier tiller production, but in Joss and Rivett this resulted in fewer spikes at harvest. Different vernalization treatments on Yeoman and Rivett wheat suggested that, for a shorter exposure of 7 or 14 days, 3° C. was more effective than 1°, which gave greater stimulative action at the longer exposures of 21 and 28 days.

The effect of a spring frost on yields of spring sown grain, J. B. Harrington (*Sci. Agr., 16 (1936), No. 10, pp. 538–548*).—The grain yields of cereal plants badly injured in the seedling stage by a spring frost (E. S. R., 75, p. 617) were compared with those of adjacent plants showing no injury, and the relation of seedling frost injury and grain yield also was examined in replicated comparative rod-row plat tests of cereal varieties.

Individual frost-injured plants averaged very significantly lower in yields than adjacent noninjured plants in Colsess barley and Bison flax. The difference between the average yield of injured and noninjured plants was much larger in Colsess barley and in Crown, W. R. 28, and Bison flax than in Marquis wheat or Banner oats. Significant differences in yield losses attributable to the frost were found among the six varieties. Plat yields were either not correlated or else only weakly correlated with the seedling frost injury data.

Crop production in northeastern New Mexico under severe soil-blowing conditions, J. Carter, Jr. (*New Mexico Sta. Bul. 243 (1936), pp. 15, figs. 7*).—Crop varieties found best adapted for areas in northeastern New Mexico where soil blowing is likely to occur include Western Blackhull, Dawn, and Early Red kafirs, Kalo, hegari, Beaver, and Dwarf Yellow and Sooner milos for grain; Leoti Red and Early Sumac sorgos and Sunrise kafir for forage; and Hays Golden, Union County White, Minnesota No. 13, Swadley, and White Flint corn. Sudan grass is indicated as valuable for forage and wind erosion control, and its stubble offers excellent protection against soil movement. Emergency cover crops to be sown in late summer to protect the soil against wind erosion include early maturing forage sorghums, as Early Sumac and Leoti Red, Sudan grass, and White Wonder and Big German millet. The soils and climate of the region are described briefly.

The choice of crops for saline land. T. H. Kearney and C. S. Scofield (*U. S. Dept. Agr. Circ. 404 (1936), pp. 24*).—Crop plants adapted to different degrees of salinity (an excess of readily soluble salts in the soil) and their relative tolerances to salt are discussed, and comments are made on considerations governing the choice of crops for saline land, constituents of the salts and their effects, sources of salinity, and on cultural and irrigation methods for saline areas. The circular is a revision of Farmers' Bulletin 446 (E. S. R., 25, p. 228), which it supersedes.

Hairy vetch and Austrian winter peas for soil improvement: A progress report (*Alabama Sta. Circ. 74 (1936), pp. 12, figs. 4*).—Results of field tests, 1930–35, at several substations to determine the merits of vetch or Austrian winter peas for increasing cotton and corn yields are reported, and suggestions for the success of these crops are given.

Where cotton and corn were grown continuously on respective areas, vetch or Austrian winter peas turned under increased the yield of seed cotton 628 lb. and of corn 15.6 bu. per acre. The increase in cotton yield due to the legumes was worth $3.78 per acre net more than that from 225 lb. of sodium nitrate or its equivalent. Where continuous corn was preceded by one of these legumes the increased yield cost 16 ct. per bushel. The legume in a 2-yr. rotation (cotton-winter legume-corn) increased the corn yield 18 bu. per acre at a cost of 14 ct. per bushel, and the residue in the second year from these legumes increased the cotton yield by 213 lb. of seed cotton.

When inadequately fertilized with phosphate, these legumes usually failed to make enough growth to increase cotton and corn yields economically, and the reverse held true. To provide nitrogen enough for the succeeding crop, the tops of the legume should be plowed under, since about 90 percent of the total nitrogen in the plant is in the tops at the proper time for turning.

Essentials for the success of these legumes for soil improvement include early (September or October 1 to 15) planting, preferably drilled inoculated (at first time planting) seed at the rate of 20 lb. per acre of hairy vetch and 30 lb. per acre of Austrian winter peas; using 300 to 400 lb. of superphosphate or 600 lb. of basic slag unless the land has been well fertilized with phosphorus for several years; and turning under in the spring when the green tops from 100 sq. ft. weigh 15 to 20 lb., delaying the planting of the succeeding crop at least 2 weeks afterward.

Results of crop rotations in Coastal Plain, Piedmont, and mountains, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 100 (1936), pp. [1]+5*).—Average results (9 to 13 yr.) on typical soils in the Coastal Plain, Piedmont, and mountain regions of the State are tabulated for continuous cropping; 2-yr. rotations of major crops with and without legumes; 3-yr. rotation with legumes; and 2-yr. rotation of corn and soybeans, half for hay and half for beans and the rest of the crop plowed under for soil improvement. The 2- and 3-yr. rotations with legumes plowed under produced satisfactory yields for major crops only with fertilizer and limestone, largely because without such treatments legume stands usually were poor and the growth of surviving plants was very small.

Cultivated crop plants of the British Empire and the Anglo-Egyptian Sudan (tropical and sub-tropical), H. C. Sampson (*Roy. Bot. Gard., Kew, Bul. Misc. Inform., Add. Ser. 12 (1936), pp. VIII+251*).—This inventory of cultivated crop plants lists the species under their respective genera, which are arranged alphabetically in the text. Information is given on their geographic distribution, synonyms, country of origin, and uses. A section of the work is also devoted to more detailed descriptions of the characteristics of several important species, and an index to commonly used synonyms is appended.

[**Field crops experiments in Arizona**] (*Arizona Sta. Rpt. 1935, pp. 30, 32–36, 72–76, 90–92*).—Brief reviews are given on the progress of research with field crops (E. S. R., 73, p. 462) at the station and substations, including variety tests with corn, wheat, barley, oats, grain sorghum, and flax; a variety-date-of-planting test with oats; breeding work with cotton and grain sorghum; inheritance studies with cotton, alfalfa, and wheat; clipping tests on varieties of wheat, barley, and oats as preliminary to a pasture experiment; effect of variations in sun exposure on color of alfalfa hay; studies of certain factors influencing maturity and length of cotton fibers; and range ecology research. Cooperation with the U. S. Department of Agriculture was active in certain lines of work.

[**Field crops research in Kentucky**] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 24, 25, 30, 31–33, 44–46, 57, 59, 61, 62*).—Progress results are reported from agronomic experiments (E. S. R., 73, p. 770) at the station and substations, including variety tests with corn, wheat, sorgo for sirup, potatoes, red clover, lespedeza, and alfalfa; breeding work with wheat and corn; fertilizer tests with corn (hill v. broadcast), potatoes (nitrogen sources), and lespedeza; rotation, fertilizer, and liming tests and a study of nicotine content, all with tobacco; a planting test with potatoes; the effect of freezing sweetpotato vines on the keeping quality of the crop; effectiveness of phosphates in a 3-yr. rotation of corn, wheat, and mixed grasses and legumes; experiments with bluegrass for pasture and seed production; study of the chemical composition of lespedeza hay from different varieties and localities; and analyses of the fall growth of rye, barley, wheat, oats, and bluegrass.

[**Field crops experiments in Tennessee**], H. P. OGDEN, L. S. MAYER, N. I. HANCOCK, B. D. DRAIN, K. L. HERTEL, B. P. HAZLEWOOD, and F. S. CHANCE (*Tennessee Sta. Rpt. 1935, pp. 11, 12, 13–16, 17, 18, 37, 38, 39, 42, 43, 46, 47, 48, 49*).—Agronomic research at the station and substations (E. S. R., 75, p. 767), reviewed briefly, included breeding work with corn, cotton, oats, barley, sweetpotatoes, and winter peas; variety tests with corn, cotton, wheat, oats, rye, potatoes, sweetpotatoes, soybeans, lespedeza, and tobacco; cultural, including planting, experiments with soybeans and *Lespedeza sericea*; cutting and fertilizer tests with annual lespedezas; seed treatments and a seeding on winter grasses test with *L. sericea*; injurious effects of hop clover on stands of *L. sericea*; tests of new phosphorus carriers in fertilizer mixtures for various field crops and vegetables; a fertilizer test with tobacco; comparison of winter cover crops; lint studies, development of technic for measuring fiber properties, and pollen germination tests, all with cotton; and crop rotations. Certain lines of work were in cooperation with the U. S. Department of Agriculture and the Tennessee Valley Authority.

Yield and composition of alfalfa as affected by various fertilizers and soil types, S. C. VANDECAVEYE and L. V. BOND (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 491–505, figs. 3*).—Effects of several combinations of fertilizers upon the yield and upon the mineral and nitrogen contents of alfalfa hay grown on different soils were studied by the Washington Experiment Station. The eastern Washington soils involved included Winchester sand, Ritzville sandy loam, and unclassified loams, sandy loam, and gravelly sandy loam, while the western Washington soils were Puget sandy loam, Puget, Felida, and Dungeness silt loams, and Lynden sandy loam.

With few exceptions, application of fertilizer resulted in an increased yield on both eastern and western Washington soils, but the average yield on the eastern soils exceeded that on the western soils irrespective of fertilizer treatments. Likewise, the amount of nutrients absorbed per ton of hay was greater on the former soils, but the quantity of nutrients removed per acre was very

much in proportion to the yield in both areas. Nitrogen, phosphorus, and potassium fertilizers applied alone or in combination to the soils in western Washington usually did not appreciably affect the percentages of those elements in the alfalfa hay, but the phosphorus and potassium contents of the hay tended to increase as a result of phosphate and potash fertilization applied to eastern Washington soils. The calcium content of the crop did not seem to be affected appreciably by the fertilizers, but tended to vary inversely with yield. On an average the higher percentages of nitrogen and calcium were found in alfalfa from the eastern soils and the higher percentages of phosphorus in alfalfa from the western soils.

Climatic conditions exclusive of available water seemed to influence the composition of alfalfa in the two areas of the State and on the same experimental plat in successive years. Alfalfa grown in the humid area of western Washington generally had a higher phosphorus content than that grown in the arid area of eastern Washington. Also, the composition of the alfalfa in successive years on the same soil varied in both areas.

In most cases the hay contained enough phosphorus and calcium for general feeding purposes of livestock and for the high requirements of lactating dairy cows. In the few exceptions in which the phosphorus content of the hay was below a certain assumed minimum, phosphorus fertilization raised it above that minimum and at the same time resulted in appreciable yield increases.

Size of plat and number of replications necessary for varietal trials with white pea beans, C. M. Loesell (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 534–547*).—Data obtained from 1,890 10-ft. plats (rows 28 in. apart) of Robust beans grown at the Michigan Experiment Station and studied by the analysis of variance method indicated that plats 30 ft. long and 1 row wide replicated four times were more efficient in the use of land for the reducing of the standard error in percentage of its mean than all the other 107 shapes and sizes studied, except the original ultimate units 10 ft. long and 1 row wide. Field operations, such as planting, harvesting, and threshing, and subsequent laboratory determinations indicated that the use of plats 30 ft. long and 1 row wide, which requires only 4 replications, is more desirable than use of the more land-efficient but smaller plats 10 ft. long and 1 row wide, which requires 10 replications.

Influence of fertilization, irrigation, and stage and height of cutting on yield and composition of Kentucky bluegrass (Poa pratensis L.), G. B. Mortimer and H. L. Ahlgren (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 515–533*).—Report is made on a field study pertaining to the influence of fertilization, irrigation, and stage and height of cutting on the yield and composition of bluegrass, in progress at the Wisconsin Experiment Station, 1928–34. For convenience of presentation, results from only 10 plats from approximately 80 are given.

Available nitrogen and water were found to be the most important limiting growth factors. Mineral fertilization alone gave only small increases in yield. Nitrogen in conjunction with mineral fertilization and irrigation consistently doubled, and in some instances trebled, the yield of grass, while nitrogen alone did not give maximum increases. Water alone, 1930–34, doubled yields.

The grass when mowed to ground level produced higher seasonal yields than when it was cut higher, i. e., 1.5 in. Grass cut when from 8 to 10 in. high to ground level gave only slightly greater increases in yield and was appreciably lower in P_2O_5 and CaO content than grass cut when from 4 to 5 in. high. When moisture was not a limiting factor of growth, the P_2O_5 content of grass cut regularly was lowest during early spring, attained a maximum in July and August, and dropped slightly in the fall. There was a uniform rise in CaO content from spring to fall.

Nitrogen fertilization lowered the CaO and P_2O_5 content of the grass. Its phosphorous content was increased appreciably by phosphate fertilization. Grass high in nitrogen was produced only when nitrogen was applied often throughout the growing season. The percentage nitrogen content of the herbage, the percentages of nonprotein, water-soluble nitrogen and of true protein, and the acre production of crude protein varied directly with the amount of nitrogen applied as fertilizer. The nitrogen content of herbage also may be increased by application of phosphorus and potash but decreases toward plant maturity. Recovery of fertilizer nitrogen, when moisture was not a limiting growth factor, ranged in 1934 from 39.5 to 121.7 percent, or an average of 87.6 percent for all plats receiving nitrogen.

Blue grama grass for erosion control and range reseeding in the Great Plains and a method of obtaining seed in large lots, J. L. Fults (*U. S. Dept. Agr. Circ. 402 (1936), pp. 8, figs. 5*).—Harvesting trials with horse-drawn and motor-driven bluegrass seed strippers at North Platte, Nebr., in October 1934 and at O'Neill, Nebr., in August 1935 showed that these machines can be used economically to harvest tops of blue grama (*Bouteloua gracilis*). In threshing tests, seed with purities of 19 and 94 percent was obtained from a bluegrass thresher at a cost of 79 ct. a pound. Material harvested on a large scale was threshed most economically in an ordinary grain separator after certain adjustments were made, providing seed with purities of 15 and 24 percent at a cost of 19 ct. a pound. Pure seed with slight breakage was obtained when blue grama strippings were run through a hammer mill and subsequently cleaned in a fanning mill, but the hammer mill proved impracticable for large-scale operations because of low daily output.

Investigations on the root of Manihot utilissima Pohl.—Progress report, H. E. Cruz Monclova (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 2, pp. 649–654*).—The moisture, fiber, ash, starch, and HCN contents are tabulated for 44 varieties and strains of cassava for 4.5- and 12-mo. growing periods, and the color, type, and thickness of skins, underskin, rind, and pulp are indicated for 25 of the varieties. Preliminary results indicate that the water content and also the HCN content of the root decreases with age, although these varieties are not in general of the same degree for different varieties.

Corn varieties for North Carolina, 1925–1935, P. H. Kime and G. K. Middleton (*North Carolina Sta. Agron. Inform. Circ. 98 (1936), pp. [1]+6*).—Varieties of corn are recommended for the Coastal Plain, eastern and upper Piedmont, and for lower and upper mountain areas of North Carolina, and for silage from the results of tests at the station and substations.

Effect of seed coat injury on germination, vigor, and yield of corn, B. Koehler (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 52–54*).—Seed coat injuries at the crown of corn kernels in Illinois Experiment Station studies caused significant reductions in yield (even though the seed coat was punctured only), due to reductions in stand and in vigor of growing plants. Removal of the seed coat from a small area on the sides of the kernels where horny endosperm only was exposed did not result in abnormal growth or significant reduction in stand or yield. Removal of tip caps might have had slight detrimental effects, although reductions found were not significant statistically. When seed with injured seed coats were treated with ethyl mercury phosphate, results were obtained nearly equal to those from uninjured seed. The adverse effects of a number of fungi isolated from the internal tissues of injured kernels several weeks after planting are described.

The relation between stand and yield in corn, I. J. Johnson (*Minn. Seed Grower, 9 (1936), No. 2, pp. 1, 2*).—Data cited from Minnesota Experiment Sta-

tion tests indicate that reduction in corn yield due to poor stands may be lessened by use of seed with high germination, treatment with an organic mercury dust, and proper selection of planter plates. The superiority of hybrids to farm varieties in average stands also was shown.

Sea-island cotton in Puerto Rico and its relation to production in the continental United States, W. H. Jenkins (*Puerto Rico Sta. Agr. Notes No. 71 (1936), pp. 9*).—The status and prospects of the crop in Puerto Rico are reviewed, with particular attention to the decline of the industry and causes therefor, the maintenance and improvement of strains by the Puerto Rico College (Insular) Experiment Station, suggested improvements in agronomic practices, pink bollworm as a major limiting factor and its control, prospective reestablishment of the long-staple industry by a cooperative marketing association, and the relation of Puerto Rican long staple to the American cotton crop.

Flax studies.—I, The relation between weight per measured bushel, weight per thousand kernels, and oil content of flaxseed, W. F. Geddes and F. H. Lehberg (*Canad. Jour. Res., 14 (1936), No. 1, Sect. C, pp. 45–47*).—Determinations made on 146 samples of western Canadian flaxseed, 119 of which graded No. 1 C. W., 16 No. 2 C. W., and 11 No. 3 C. W., revealed that while grades were differentiated in test weight per bushel and weight per 1,000 kernels, their mean oil contents were not significantly different. Test weight per bushel was of little significance as an index of oil content. Weight per 1,000 kernels was correlated closer with oil content but not high enough to permit satisfactory prediction of oil content.

Oat production in Colorado, 1928–1935, D. W. Robertson, D. Koonce, J. J. Curtis, and J. F. Brandon (*Colorado Sta. Bul. 430 (1936), pp. 31, figs. 5*).—This publication resembles Bulletin 370 (E. S. R., 65, p. 35) in general scope but presents data for the period 1928–35.

Experiments under irrigation indicated Colorado 37 or Markton oats for conditions like those at Fort Collins and Fort Lewis, Colorado 37 in the San Luis Valley, and Markton and Kanota in southern Colorado. Test results suggest planting about 80 lb. between April 1 and 20 at the station or a little later for certain earlier varieties, and from April 15 to 30 at Fort Lewis with a single irrigation in northeastern Colorado at jointing, and where two irrigations are applied, as on lighter soils, one application at tillering and one at late jointing. Under irrigation oats usually follow a row crop. Due to immature straw found on oats grown under irrigation, long shocks of about 10 sheaves are considered better than round shocks.

Experiments on dry land at Akron, in cooperation with the U. S. Department of Agriculture, showed Brunker and Kanota to be the highest yielding varieties. Early spring seeding, before April 15, of from 4 to 5 pk. per acre is indicated. Yields on fallow surpassed those on cornland, but even with adapted varieties, as Brunker and Fulghum, the yield increase may not compensate for the loss in crop during the fallow year. While not recommended for extensive seeding on dry land, as either corn or barley usually produces more grain, oats may be cut for and fed as hay when drought prevents proper development of the crop.

The relation of age and viability to the popping of popcorn, F. C. Stewart (*New York State Sta. Bul. 672 (1936), pp. 7*).—Japan Rice popcorn stored in a cloth bag in open air, 1922–36, was tested (shelled) at 4- to 18-mo. intervals for viability, moisture content, and popping expansion, and ear corn was tested at the end of the experiment. Germination dropped from 100 percent to 0 at the end of 8 yr. Popping expansion averaged somewhat higher before than after viability was lost completely. Variations in moisture content made results of popping tests difficult to interpret. Popping quality appeared independent of

viability, of indefinite duration, and to be retained better by popcorn on the *cob than by shelled kernels. See also an earlier note (E. S. R., 51. p. 260).*

Determining the value of a new potato variety, A. G. Tolaas (*Amer. Potato Jour., 13 (1936), No. 3, pp. 60–64*).—Methods used in testing the Katahdin, Chippewa, and Warba potato varieties for adaptation, yield, disease resistance, and culinary qualities, and some of the results obtained are reviewed in this contribution from the Minnesota Experiment Station.

The effect of length of dormant period upon the subsequent flowering of the potato plant, J. C. Miller (*Amer. Potato Jour., 13 (1936), No. 6, pp. 141–144*).—Louisiana spring-grown (dormancy or time from harvest to planting 9 mo. 4 days), northern-grown (5 mo. 2 days), and Louisiana fall-grown (3 mo.) seed of Triumph, Warba, Katahdin, and U. S. D. A. seedling 44639 after storage were planted in February 1935 at the Louisiana Experiment Station. The varieties which had had the longest dormant period developed the smallest percentage of flower-producing stalks and of flowers per cluster, and more stalks and consequently more and smaller tubers per hill than those from seed subjected to a shorter dormancy. Plants from seed subjected to long dormancy germinated rapidly, were less vegetative and more prostrate in growth habit, and matured 10 to 15 days earlier than did those from seed subjected to a shorter dormancy period.

Crop rotations for potatoes, T. O. Ödland (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 52–60*).—A popular discussion of the response of potatoes to crop rotation (E. S. R., 71, pp. 309, 310), fertilizers (E. S. R., 69, p. 205), and magnesium (E. S. R., 71, p. 767; 72, p. 306) in experiments at the Rhode Island Experiment Station.

Studies on growth in rice, C. R. Adair (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 506–514, figs. 3*).—The growth of Caloro, Early Blue Rose, and Edith varieties of rice was studied cooperatively by the Arkansas Experiment Station and the U. S. D. A. Bureau of Plant Industry, 1932–34, at Stuttgart, Ark., with special attention to increases in height, in dry weight, and in the number of tillers and leaves per plant.

Plants began to tiller about 3 weeks after seeding, and by the end of the sixth week all tillers that were to form panicles had started growth. The number of leaves per culm increased slowly until panicles were formed and then remained constant. Plant height increased relatively rapidly in the first 6 weeks after planting and then increased slowly for about 2 weeks, followed by a rapid increase until flowering time, after which there was little increase. The 2 weeks of slow growth seemed due to root injury by maggots. Plant weight increased slowly for the first 5 weeks, after which tillers became established and, for a short time, owing to the activity of tiller roots, the weight increased rapidly. The rate of increase was then somewhat slower for about 2 weeks, after which, during the jointing stage, it increased rapidly. The weight of the panicles increased until maturity, but that of the culms, after flowering, decreased slightly. An early inflection of the height and weight curves in 1934 was attributed to adverse weather conditions. Each variety attained a greater height and weight of plant in 1933 than in 1932 and 1934.

Little significance could be attached in these studies to the values of A/K and K/A from the growth equation $\log: \frac{X}{A-X}=K\ (t-t_1)$, considered significant by Gaines and Nevens (E. S. R., 53, p. 533).

A note on the classification of Indian safflower, T. S. Sabnis and M. G. Phatak (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 705–714*).—The revision of the classification of Indian safflower attempted is based on that of Howard,

Howard, and Khan (E. S. R., 36, p. 228; 62, p. 633). The crop has been classified into types on the basis of distinctive characters, and 29 new types have been added.

The comparative efficiency of free and combined nitrogen for the nutrition of the soybean, W. W. UMBREIT and E. B. FRED (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 548–555, figs. 4*).—Manchu soybeans were grown at the University of Wisconsin under a variety of conditions which modified the carbohydrate-nitrogen relation of the plants. The preferential form of nitrogen for the nutrition of these plants was shown to change with the available carbohydrate present. The data suggested that under conditions which result in a balanced carbohydrate-nitrogen relation in the plant free nitrogen is the preferred form, but when conditions result in an unbalanced carbohydrate-nitrogen relation, fixed nitrogen is desirable. Since environmental conditions which produce plants with an unbalanced carbohydrate-nitrogen relation (high light intensity, drought, high CO_2, or low light intensity, low temperature, short days) are the exception rather than the rule, probably under field conditions maximum yields would be obtained with inoculated plants rather than with those dependent on fixed forms of nitrogen for nutrition. Nevertheless, certain climatic or field conditions, occasionally encountered, produce a plant with an unbalanced carbohydrate-nitrogen relation, and the use of combined forms of nitrogen would be indicated. See also a previous note (E. S. R., 73, p. 777).

Sweet potato production, H. H. ZIMMERLEY (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 188–201*).—The practical information presented, based on research by the Virginia Truck Experiment Station and other agencies, covers varieties and market preferences; soils; formulas, rates, and methods of applying fertilizers and their effects; planting and spacing; and the occurrence and control of stem rot, black rot, and scurf.

Six years of tobacco breeding, M. E. GUTIERREZ (*Philippine Jour. Agr., 6 (1935), No. 3, pp. 271–310, pls. 10*).—Efforts made, 1928–34, to improve Vizcaya, the best native cigar filler tobacco, by hybridization with Sumatra strains and constant hybrids thereof as male parents, followed by line selection and strain tests with the aim of producing wrapper and dual-purpose strains, are reviewed in some detail. Six strains have been released to planters.

The absorption of plant nutrients in relation to the production of Pennsylvania cigar-leaf tobacco, J. J. THOMAS, D. E. HALEY, and O. OLSON (*Pennsylvania Sta. Bul. 331 (1936), pp. 20, figs. 11*).—Tobacco grown in cooperation with the U. S. D. A. Bureau of Plant Industry on Hagerstown silt loam and clay loam near Lancaster, transplanted June 8, 1934, to plats in the 3-yr. rotation, tobacco, wheat, clover or alfalfa, and fertilized broadcast (also in the row) with 1,000 lb. per acre of 6–8–12 fertilizer and variations therefrom, with some plats limed or manured, was sampled July 24 and August 3, 13, and 24 and the uptake of nitrogen, phosphorus, and potassium determined.

The absorption of nitrogen, phosphorus, and potassium seemed to be correlated closely with the quantities available for the plants. That clover and alfalfa, when included in the rotation, add considerably to the nitrogen available for absorption was evident from the nitrogen content and relatively high yields of tobacco on plats receiving an 0–8–12 fertilizer at the rate of 1,000 lb. per acre. These soils responded well to potassium and also to phosphorus, best applied in 1,000 lb. per acre of a 6–8–12 mixture. Cottonseed meal appeared superior to sodium nitrate as a nitrogen carrier, although the yield and production of wrappers appeared to be correlated with the fertilizer formula. Here, too, the above mixture and rate seemed most desirable. Row applications appeared to surpass broadcasting. While large yields apparently were obtained

from addition of manure, 1,000 lb. of 0-8-12 mixture equaled 20 tons of manure in efficiency. In any case, supplementing manure with 1,000 lb. per acre of a 3-8-12 mixture seemed desirable.

Tobacco fertilizer recommendations for 1937, C. B. WILLIAMS ET AL. (*North Carolina Sta. Agron. Inform. Circ. 101 (1936), pp.* [6]).—Analyses, rates per acre, and sources of nutrients are recommended for fertilizers for flue-cured, sun-cured, and shipping tobacco, and for plant beds on tobacco soils in Virginia, North Carolina, South Carolina, and Georgia. Suggestions for control of downy mildew and root knot of tobacco are appended.

Response of wheat varieties to different fertility levels, C. A. LAMB and R. M. SALTER (*Jour. Agr. Res.* [*U. S.*], *53 (1936), No. 2, pp. 129–143, figs. 3*).—The grain yield, straw yield, and weight per bushel of 11 varieties and strains of winter wheat, grown in a 3-yr. rotation of corn, oats, and winter wheat on Canfield silt loam at 4 fertility levels for 5 seasons (1928–33) are considered, together with climatological data, in this contribution from the Ohio Experiment Station.

The analysis of variance of total yield and of grain yield indicated that differences due to variety, to fertility level, to season, and to each of the three interactions of these factors could not be ascribed to errors of random sampling alone. In all cases but one odds for significance exceeded 99:1, when all seasons were considered together. Residual error for the grain yields surpassed that for total yields, as shown by the coefficients of variability, indicating that factors other than those considered influence translocation appreciably. Date of heading and of maturity probably fall in this class, since they result in variations in the environment during the period in which the grain fills and hardens. The results obtained were held to indicate definitely that varieties respond differently to a series of fertility levels. None of the varieties used was definitely superior at only the high or at only the low levels of fertility. However, the data did not preclude the existence of such varieties.

The absorption of nutrients by two varieties of wheat grown on the black and gray soils of Alberta, E. K. WOODFORD and A. G. MCCALLA (*Canad. Jour. Res., 14 (1936), No. 7, Sect. C, pp. 245–266, figs. 9*).—Chemical analyses made at five stages of development of Reward and Red Bobs wheat (E. S. R., 74, p. 196) showed that differences in soil and variety significantly influenced plant composition. Weights of dry matter and all nutrients studied, and on the basis of percentage of dry matter, all nutrients except phosphorus, were higher for the black-soil plants. Reward surpassed Red Bobs in nitrogen content on the black soil, and in ash, phosphorus, and potassium on the gray soil. The grain of gray-soil plants was higher in all ash constituents and lower in nitrogen. Varietal differences were more marked in the grain and straw of the mature plants, Reward grain from both soils being higher in nitrogen, ash, phosphorus, and magnesium.

The total weights, percentages, rates of absorption, and ion ratios all indicated that nitrogen and sulfur were limiting wheat growth on the gray soil. It was suggested that the proportionately higher absorption of phosphorus from the soil was in compensation for low availability of nitrogen and sulfur. Differences in original quality of the wheats grown on the two soils evidently can be largely accounted for by the differences in protein content, and therefore nitrogen supply. The phosphorus absorption, nitrogen, phosphorus, and sulfur balance, and the relation of ash to protein may possibly be important in determining keeping properties of the flour. See also earlier notes (E. S. R., 70, p. 615; 74, p. 633).

The effect of applying a nitrogenous fertiliser to wheat at different stages of growth, D. J. WATSON (*Jour. Agr. Sci.* [*England*], *26 (1936), No. 3, pp. 391–414, figs. 5*).—Sodium nitrate was applied to wheat at seven different stages

from germination to emergence of 95 percent of the spikes and at rates of 1.03 2.06, and 4.15 g per pot at the Rothamsted Experimental Station. With delay in time of application, the increase in yield of total dry matter of straw was smaller. The increase in grain yield was constant for the first six applications, but the last application produced no increase. Analysis of grain yield showed that early application produced its effect by increasing the number of spikes per plant. Later treatments caused a smaller increase in spike number, but also increased the number of kernels per spike and 1,000-kernel weight. There was no evidence of a critical time for tiller formation as postulated by Doughty and Engledow (E. S. R., 63, p. 437). The increase in total nitrogen uptake was similar for all times of application, but the ratio of nitrogen in grain to nitrogen in straw and chaff increased with lateness of application.

Effect of harvest conditions on a few quality factors in wheat, C. O. Swanson (*Cereal Chem., 13 (1936), No. 1, pp. 79–90*).—Wheat was cut at the Kansas Experiment Station when the endosperm was in the milk, soft dough, hard dough, tough, and hard stages with respective moisture contents of 43.5, 41.3, 35.3, 29, and 13 percent, and then portions from each stage were dried in the sun, in the sun but covered with paper, in a basement room, and in a room kept at about 55° F. Samples cut at the last two stages, i. e., at binder maturity with 29 percent moisture and at combine maturity with 13 percent, were also soaked 10 and 30 min. and were then dried in the sun or in the shade.

Moisture and temperature appeared to affect wheat quality during harvest because they influence the rate of biological activity in wheat. The sugar content and the diastatic activity in wheat did not seem to be influenced unless the moisture content was enough to start germination. The duration of the wet condition as influenced by drying conditions is more important than the amount of wetting. Wheat cut at 29 percent moisture was not lowered in test weight, but this was depressed slightly at higher moisture contents. The percentage of yellow berry apparently was influenced more by late maturity than by drying conditions. Drying the wheat cut at high moisture contents slowly, and at a low temperature, produced an increase in diastatic activity but not in sugar content. The diastatic activity of the germ and brush ends was not much different and nearly like that of wheat. However, when the germ and brush ends were germinated for 72 hr. there were pronounced differences. Both the germ ends and the whole wheat increased in sugar content, but no increase occurred in the brush ends. Diastatic activity increased in all three, least in the brush end and most in the germ end.

The carotene content of wheat varieties in the Pacific Northwest, C. C. Fifield, S. R. Snider, H. Stevens, and R. Weaver (*Cereal Chem., 13 (1936), No. 4, pp. 463–469*).—The carotene contents of six wheat varieties grown at Aberdeen, Idaho, and Logan, Utah, in 1933 and 1934, and at Bozeman, Mont., in 1933, were determined by the U. S. Department of Agriculture.

Effects of inherent varietal characteristics were apparent in that Federation and Onas wheat, which produced high carotene values at one station, were also high at other stations, while Irwin Dicklow, Baart, and Marquis were low at all stations. It was found that environment has an important effect on carotene content of wheat.

No correlation between carotene and protein content of the grain was evident. However, carotene in wheat and carotene in the flour milled therefrom were definitely related, and crumb color of bread also was significantly correlated with carotene content of the wheat. Measurements on the various milled fractions from the same grain sample showed the bran to be highest in carotene, with decreasing values in the middlings, second patent, first clear, and first patent.

Bleaching studies showed that Federation and Onas wheat require additional treatment to remove the high percentage of coloring matter contained. Determinations on bleached flours showed the loss in carotene to be for Marquis 66 percent, Baart 63, White Federation 52, Irwin Dicklow 51, Federation 51, and Onas 43 percent. Flour milled from Federation and Onas after bleaching contained more carotene than the Irwin Dicklow flour before bleaching.

Physical tests to determine quality in wheat varieties, C. O. Swanson (*Cereal Chem., 13 (1936), No. 2, pp. 179–201, figs. 9*).—Several recent physical devices for testing desirable characteristics in dough, including the Chopin extensimeter, the Bühler comparator, the Brabender farinograph, and the Swanson-Working recording dough mixer (E. S. R., 69, p. 460) developed at the Kansas Experiment Station, are discussed, and characteristic dough curves made on the last-named device are illustrated and described for different types of commercial flour and for flours made from the hard red spring wheats Marquis, Ceres, Reward, and Thatcher; the hard red winter wheats Turkey, Karkov, Tenmarq, Blackhull, Early Blackhull, Cheyenne, Oro, Cooperatorka, Kanred, and Quivira, a number of soft wheats grown in other States; and the Kansas soft wheats Fulcaster, Kawvale (semihard), Harvest Queen, and Clarkan. The merits of dough curves as criteria of wheat quality are pointed out.

A collaborative study on the use of the wheat meal "time" test with hard and soft wheats, E. G. Bayfield (*Cereal Chem., 13 (1936), No. 1, pp. 91–103*).—Results of collaborative studies made on hard red spring wheat from Canada, hard red winter wheat, and soft winter wheats, reported in this contribution from the Ohio Experiment Station, led to conclusions in harmony with those noted earlier (E. S. R., 74, p. 484). Time data presented for both hard red spring and soft winter wheats did not give as reliable a strength rating for the samples as was given by the baking tests. "Considering all data, the baking test still remains the best all-round test for strength provided a baking procedure which brings out the characteristics of a flour is used." However, the author thinks that the time test will prove helpful to the wheat breeder as a low cost aid in segregating undesirable extremes in breeding material at an early stage before enough grain is available for a milling and baking test. Even in these early stages the time test should proceed in conjunction with a protein determination.

Longevity of some farm crop seeds, P. A. Rodrigo (*Philippine Jour. Agr., 6 (1935), No. 3, pp. 343–357, figs. 4*).—During a study of the longevity of a number of varieties of farm crop seeds, 1924–35, seeds stored in sealed or airtight containers remained viable much longer than those stored in cloth bags or non-air-tight containers. Seeds in sealed containers, like legumes, could show renewed vigor of viability after having exhibited signs of being critical, e. g., black tapilan (*Phaseolus calcaratus*). The life duration of seeds in the airtight containers was for rice 79.5 to 85.5 mo., corn 63 to 82.5, cowpea 114 to 123, soybean 54, and peanut 36.5 mo., while mung and tapilan in sealed containers with or without naphthalene still showed signs of fairly strong viability after 11 yr. and 3 mo. in storage. Naphthalene seemed to have a slight ill effect on the longevity of seeds in airtight containers.

Petroleum sprays for dandelions, W. E. Loomis and N. L. Noecker (*Science, 83 (1936), No. 2142, pp. 63, 64*).—In experiments on the control of dandelions with petroleum sprays, made at the Iowa Experiment Station, certain higher-boiling hydrocarbons contained in the groups sold as distillates and kerosene showed a remarkably differential action when sprayed on bluegrass lawns at the rate of 200 or 300 gal. per acre. Under favorable conditions dandelions were slowly but completely killed, while bluegrass sod was only affected tempo-

rarily. The results suggest spraying only the water-white products and in cool weather and favor fall applications.

HORTICULTURE

[Horticultural studies by the Arizona Station] (*Arizona Sta. Rpt. 1935, pp. 10, 11, 18, 19, 24–28, 55–67, 68, 69, figs. 3*).—Reports are presented on investigations dealing with the storage of grapefruit; the irrigation of citrus trees; phenology of date varieties; thinning of dates; protection of dates from rain damage; pasteurization and storage of dates; fertilization of citrus trees; effects of waxing cantaloups on their keeping quality; factors affecting the growth, filling, and maturing of pecans; testing of pecan varieties; fertilizers for lettuce, cabbage, spinach, carrots, and turnips; and the testing of strawberry varieties.

[Horticultural studies by the Kentucky Station] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 42–44, 47–50, 63–66*).—Among studies discussed are the effect of phosphate fertilizers on lima bean production, the cultivation of lima beans, the nutrition of the tomato in a drying soil, testing of tomato varieties, comparison of black raspberry tip plants produced by vigorous and weak canes, cover crops for apple orchards, and seasonal changes in the soluble nitrogen and phosphate phosphorus content of apple and peach terminals.

In addition notes are presented on the following work at the Western Kentucky Substation: Cultural experiments with apples and peaches, pruning of peaches, fertilization of the strawberry and raspberry, and the spraying of raspberries and dewberries.

[Horticultural studies by the Tennessee Station] (*Tennessee Sta. Rpt. 1935, pp. 28, 36, 37, 38, 43, 48, 49*).—Brief reports are presented on projects dealing with the removal of fluorine spray residues, by G. A. Shuey; and the breeding of rhubarb, blight-resistant pears, and tomatoes for leaf spot resistance; breeding and culture of raspberries, strawberries, and grapes; testing of the Glendale gooseberry, peach varieties, and blight-resistant chestnuts; culture of asparagus; testing of rust-resistant pole beans and of top-cross selections of Golden Bantam corn; the development of high-yielding strains of pyrethrum; testing and liming of ornamentals; and apple orchard soil management, all by B. D. Drain.

Effect of carbon dioxide on the carbohydrates and acidity of fruits and vegetables in storage, E. V. Miller and O. J. Dowd (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 1, pp. 1–17, figs. 10*).—Utilizing as containers 5-gal jars held at 0°, 5°, 10°, 15°, and 20° C., the authors studied the response of several vegetables and fruits to different concentrations of carbon dioxide. It was observed that there may be a considerable lag in lowering the temperature of the vegetables to that of the storage chamber. In the case of sweet corn of about 27° at the time of storage there occurred a rise in the first 2 hr. to a maximum of 31.9°. On the other hand the temperature of lima beans began to drop as soon as the beans were placed in storage. Many hours were required to lower the temperature of the vegetables to that of the storage room, and in the case of corn this condition was not reached in the center of the ears during the entire test. The potential importance of carbon dioxide in retarding respiration in the first 24 to 48 hr. is thus indicated.

Sweet corn held for 24 hr. in 37 to 50 percent of carbon dioxide retained about twice as much sugar as the controls, but after being canned it lost some of its original flavor. The loss of sucrose was retarded in lima beans and carrots by storage in approximately 40 percent of carbon dioxide. The effect

was much more pronounced at 15° and 25° than at 5°. Carbon dioxide had no effect on acidity of Early Richmond cherries in 24 hr. or on Elberta peaches in 48 hr. Burbank plums treated with 50 percent of carbon dioxide for 6 days lost in total acidity at 0°, 10°, and 20°, but there was no consistent change in the H-ion concentration. Earliana and Marglobe tomatoes treated for 6 days with 50 percent of carbon dioxide showed a reduction in total acidity at 20° and a reduction in H-ion concentration at 10° and 20°. The treatment of carrots with 45 percent of carbon dioxide for 11 days at 20°, 14 days at 10°, and 15 days at 0°, did not reduce their carotene content. Carbon dioxide had no permanent effect on carbohydrate transformation in peas and corn, but for several days after treatment the vegetables contained more sugar than did the controls. It was found that too high a concentration of carbon dioxide may retard pigment formation in Marglobe tomatoes, but that the acidity changes are similar to those in untreated fruits and that the usual reduction in acidity accompanying ripening proceeds normally.

The uncertain Hypholoma, F. C. STEWART (*New York State Sta. Bul. 666 (1936), pp. 16, pl. 1, figs. 4*).—A complete description is presented of a small edible mushroom (*H. incertum*) which frequently grows in abundance about old tree stumps in lawns in New York State from early June to late September. An instance is cited in which the species was confused with another of doubtful edibility, namely, *Inocybe lanatodisca.* At Geneva a stump may yield from 1 to 9 successive crops of the fungus per season and continue to bear for several years. One dying stump of a hickory tree yielded mushrooms for 14 successive seasons. An attempt to transplant the fungus from beside a maple stump to the former site of a willow bush was unsuccessful. The methods of cooking are outlined.

Some relations between leaf area and fruit size in tomatoes, F. G. GUSTAFSON and E. STOLDT (*Plant Physiol., 11 (1936), No. 2, pp. 445–451, figs. 4*).—Investigations in which pot-grown tomato plants pruned to a single stem were limited to definite numbers of leaves and fruits, showed that plants with several leaves were no larger than those with one leaf. Judged on the basis of color and taste, the fruits produced with one leaf per plant were normal. Although an increase in the leaf area per plant did increase fruit size considerably, the increase was not in direct proportion, indicating that factors other than nutrition at the time of enlargement influenced the ultimate size of tomato fruits. The efficiency of the plants as far as fruit production was concerned was greatest when the leaf area per fruit was small.

The internal temperatures of fruit-tree buds, J. GRAINGER and A. L. ALLEN (*Ann. Appl. Biol., 23 (1936), No. 1, pp. 1–10, figs. 10*).—With the aid of thermocouples inserted in the buds of apples, black currants, and red raspberries, readings were taken on changes in temperature as correlated with those of the surrounding air. No varietal difference was noted between Bramley Seedling and Worcester Pearmain apples. In 78 of 82 daily records on Bramley Seedling the buds were warmer than the air during the day and cooler during the night. The cooling of the buds at night is ascribed to the direct loss of heat by evaporation, with radiation as an important secondary factor on clear nights. Black currant buds, on the other hand, were usually cooler than the surrounding air during the day time, possibly due to their greater evaporation. The Lloyd George raspberry buds were generally intermediate between the apple and the black currant in their temperature responses. Behavior during a period of cold seemed to indicate that apple buds have a mechanism of resistance against frost, whereas the black currant has no such protection.

Environment and its influence upon deciduous fruit production, O. S. H. Reinecke (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 2, pp. 164–174, figs. 5*).—Based on a study of tree behavior of a considerable number of varieties in the experimental orchards of the University of Stellenbosch, the author concludes that the Union of South Africa is so situated geographically that the period of dormancy is too short and the minimum winter temperatures are too high for many deciduous fruit trees. The critical mean maximum temperature for the four winter months in relation to delayed foliation appeared to be approximately 64.5° F. at Stellenbosch, and where the temperatures were higher either the quality or quantity of the fruit suffered. Since 1917, and particularly from 1925 onward, the winters were unusually mild. Since varieties differ in their temperature requirements, the author suggests that poor bearing trees be top worked to more successful varieties. Some beneficial effects in spraying susceptible varieties with oil emulsions are indicated.

Some physiological effects of oil sprays upon deciduous fruit trees, M. W. Black (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 2, pp. 175–202, pls. 4, figs. 5*).—At the University of Stellenbosch, Union of South Africa, where delayed foliation is often a serious problem, branches of Bon Chretien and Beurre Hardy pear and White Pearmain apple trees were sprayed with a 5 percent raw linseed oil emulsion in an attempt to aid in breaking the rest period. In addition, supplementary studies were made with seal oil and two proprietary mineral oil emulsions, using chiefly the Ohenimuri apple and the Bon Chretien pear. In years when delayed foliation was prevalent marked benefit was secured from properly timed oil treatments. Under the conditions of the experiment the most effective spraying would range from 4 to 8 weeks prior to the first opening of blossoms. The degree of response to oil treatment was apparently correlated with the susceptibility of the variety to delayed foliation, susceptible kinds, such as Bon Chretien and Glou Morceau pears, being readily influenced by the oil sprays. The author does not advance a scientific explanation of the phenomenon but states that it is under study.

Stationary equipment for orchard spraying and the manufacture of home-made liquid lime-sulfur, F. H. Ballou (*Ohio Sta. Bul. 572 (1936), pp. 26, figs. 7*).—This paper is presented in two parts, (1) Stationary Equipment for Orchard Spraying, and (2) Home Making of Liquid Lime-Sulfur.

Under part 1 there are discussed the comparative merits of stationary and mobile spraying equipments, the locating of a stationary plant, and the planning, equipment, and operation of the stationary plant constructed at the Dale View test orchards. Some data are presented on the relative capacity and cost of operation of the two types of spraying equipment.

In part 2 there are presented a description of an experimental boiling plant and storage for home-made lime-sulfur and information on the preparation of the material.

Bruising in harvesting and handling apples and its relation to spray residue removal, E. L. Overholser (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 51–62*).—Observations in western New York on the bruises received by apples during harvesting operations showed a direct relationship to the firmness of the flesh. In certain tender varieties there were few bruise-free apples when the fruit reached the packing house. The individual who picked the fruit and the type of container used in picking were found important factors in bruising. In the washing machines the underbrush type washer caused considerable more bruising than did the flotation type. Driers with walk-over or shuffleboard types of conveyors were found to cause considerable bruising. Various suggestions are made as to better methods of handling fruit in the packing house and in storage.

Absorption, distribution, and seasonal movement of potassium in young apple trees and the effect of potassium fertilizer on potassium and nitrogen content and growth of trees, R. F. CHANDLER, JR. (*Jour. Agr. Res.* [U. S.], *53* (*1936*), *No. 1, pp. 19–42, figs. 11*).—In studies carried on at the University of Maryland with nursery Stayman Winesap trees, it was found that the absorption of potash was proportional to dry weight accumulation. Absorption began slowly, continued at a rather rapid rate during the growing season, and slowed down toward the end. Except for the leaves after abscission began, the absolute amounts of potash in all parts of the tree increased throughout the season. The relative proportions of potash in the new growth generally increased throughout the season, whereas in the 1- and 2-yr. wood there was a decrease. In the roots the amount of potash seemed to decrease markedly during the period of rapid growth but increased during the latter part of the growing period. On a percentage dry weight basis the roots tended to increase in potassium concentration during the last months of the season. On the same basis the potassium content of the new wood tended to decrease throughout the season, that of the 1-yr. wood increased during May and later decreased, and that of the 2-yr. wood remained constant. The new wood formed in diameter increase corresponded closely in potassium content to that of the new twigs.

Young leaves contained much more potassium than did the old leaves, and in general the concentration decreased from the apex to the base of the tree despite the fact that in actual amount the reverse was true. Applications of potash as fertilizer resulted in an increased intake by the tree and an increased concentration in all parts. Heavy applications of potash increased the nitrogen content of the trees. In fact there was a rather high correlation between nitrogen and potash, although the seasonal absorption and utilization of the two elements differed. Under the conditions of the experiment there were no growth differences that could be attributed to potash.

Some special problems in fruit growing, A. J. HEINICKE (*N. Y. State Hort. Soc. Proc., 81* (*1936*), *pp. 96–103*).—Citing the great variation in the percentage of dropping McIntosh apples at harvest time from year to year, the author discusses possible causes and reports that at Cornell University heavy applications of nitrogen in late summer seemed to increase the percentage of drops. Heavy mulching of the trees did not materially influence dropping, and on the whole pruning appeared to have no consistent influence.

To establish the best date for picking Cortland apples, fruits were harvested at 10-day intervals from early September to about November 1. In 1935 apples harvested October 5 on the same date as McIntosh were firmest of all lots on January 15. The desirability of making at least two pickings of Cortland apples designed for storage is suggested, and the need of a high-yielding and long-keeping variety ripening after McIntosh is indicated.

Plum rootstock studies: Their effect on the vigour and cropping of the scion variety, R. G. HATTON (*Jour. Pomol. and Hort. Sci., 14* (*1936*), *No. 2, pp. 97–136, pls. 4*).—Stating that an earlier paper (E. S. R., 60, p. 45) outlined the general problem, the author reports that despite several disturbing factors, such as the incidence of disease and the appearance of delayed incompatibilities, considerable evidence was secured to show that rootstocks influence both growth and cropping of plums. In general, *Prunus cerasifera* rootstocks gave the most vigorous trees, and it was noted that rootstocks within the *P. insititia* species such as common Mussel, common plum, and some of the St. Julien selections may be expected to produce trees of comparatively moderate vigor. Growth and productivity were not necessarily closely associated, at least up to the end of 14 yr. The varieties under test fruited as well on their own roots as on precocious rootstocks, but there was evidence that trees developed more

rapidly upon *C. cerasifera* roots. Marked variation noted in the commercial stocks of St. Julien and Black Damas were manifested by striking differences in the orchard trees in fruiting and growth. Rootstocks were observed to affect also the time of maturity and the size of fruit in some cases. There were indications that trees on common plum recovered more readily from silver leaf and bacterial die-back diseases. The need of extended field trials to determine specific compatibilities and incompatibilities is suggested. On the whole, it is believed that the selection of desirable combinations of rootstock and scion is more important in the plum than in the apple.

Recent developments in small fruit culture, G. M. Darrow (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 10–20*).—Incidental to a general discussion the author presents data obtained at the Horticultural Research Station, Beltsville, Md., on the relation of number of leaves per strawberry plant in autumn to the number of flowers and fruits the next spring. On the average, Blakemore, Fairfax, and Dorsett plants with 10 leaves produced five times as many fruits as did the 2-leaf plants, and the berries averaged larger. Beds held over for the second fruiting season were mowed on July 1, August 1, and September 1. In all three varieties, Blakemore, Joe, and Howard 17, early mowing was distinctly beneficial, increasing the yields by 22, 13.5, and 12.1 percent, respectively. August mowing on the average was of dubious value, and September mowing was distinctly injurious to all three varieties.

A comparison of methods of scooping and handpicking the cranberry crop, C. A. Doehlert (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 66 (1936), pp. 11–15, fig. 1*).—On a series of plats laid out in a commercial planting of the Early Black cranberry, the New Jersey Experiment Stations compared three methods of harvesting, namely, hand picking, scooping from a standing position, and scooping from a kneeling position. The average yields per acre were 120.1, 94.6, and 98.7 bbl., respectively. The dropped berries were collected from small measured areas and showed average losses of 4.4, 21.5, and 14 percent of the total crop, respectively, for the three treatments. There was considerable tearing of the vines, particularly on the plats scooped from a standing position. It is planned by further records to establish the effects of tearing the plants on the continued productivity of cranberry bogs.

A twenty-five year test of commercial fertilizers for grapes, F. E. Gladwin (*New York State Sta. Bul. 671 (1936), pp. 24*).—An analysis of records taken over the 25 yr. from 1909 to 1934 on differential fertilizer plats in a Concord vineyard located on Dunkirk gravelly loam in Chautauqua County showed that of the three plant foods, namely, nitrogen, phosphorus, and potash, nitrogen had produced more and better fruit and greater vegetative growth. A statistical analysis of the 25-yr. averages, using Student's method, showed all fertilizer treatments better than the controls, and nitrogen and potash in all cases gave significant increases in yield. In one case phosphorus showed no significance and in another was barely significant, indicating that this element had been of doubtful value. Since the yields were less where lime was added with the nitrogen, phosphorus, and potash than where the combination was used alone, it is suggested that lime depressed yields. Chemical analyses of the soil showed an abundance of potassium but a low supply of nitrogen and phosphorus. No material had any influence on fruit maturity or on the capacity of vines to resist winter injury. The sugar content of the fruit was not affected by fertilizer treatments, and none of the three elements had any decreasing effect on the shelling of the berries. Somewhat similar tests begun in 1914 on Dunkirk silt loam were found to be showing the same general trends as on the soil in question. All combinations of nitrogen, phosphorus, and

potash proved highly profitable, although the real gains were apparently derived from nitrogen and potash, and the high prices prevailing during the prohibition era were an important factor in boosting the profits from the use of fertilizers. In conclusion the author advises that fertilizers will not be profitable on poorly drained soils or on any soil if weeds are not controlled during the active growing period. Applications should be made in early spring, and rye is considered the most satisfactory green manure crop.

Growth and water relations of the avocado fruit, A. R. C. Haas (*Plant Physiol., 11 (1936), No. 2, pp. 383–400, figs. 13*).—Observations by the California Experiment Station at Riverside on Northrop avocados of different sizes indicated that the region of greatest growth lies between the largest diameter and the stem end. An examination of the stomata showed a uniform distribution in young fruits, with a distinct tendency for the stomata to become more widely separated toward the stem end as development proceeded. In thick-skinned avocados the death of a stomata was usually followed by lenticel formation, which prevented the invasion by fungi but at the same time limited gaseous exchange, with a consequent loss in quality and often discoloration. Observations on fruits immersed in distilled water and also on fruits exposed in the orchard to rain showed spotting and checking injuries of similar type. In laboratory tests with mature Puebla fruits it was observed that the skin of the tip half is more permeable to water than is that of the stem portion. Using several different varieties, it was found that the water loss is consistently greater in the tip than in the stem half. Immature fruits of any given variety lost water more rapidly than did maturer specimens.

Pyrethrum plant investigations in Colorado.—II, A review of the progress since 1932, C. B. Gnadinger, L. E. Evans, and C. S. Corl (*Colorado Sta. Bul. 428 (1936), pp. 29, figs. 4*).—In this second paper (E. S. R., 70, p. 53), further evidence is presented to show that there is considerable variation in the number and weight of flowers and also a wide variation in the pyrethrin content of flowers produced by individual plants during a single year and from year to year. No correlation was established between the yield of pyrethrins from a given plant and the number and weight of flowers produced by the plant from year to year. Self-pollination studies showed wide differences between strains in their self-fruitfulness. Apparently one generation of inbreeding had little effect on the yield of pyrethrins. Progeny resulting from open pollination of high-yielding mother lines yielded somewhat more pyrethrins than did the common run of seed stock. That environment, particularly mean temperature during the growing period, is important in relation to pyrethrin content was indicated in the higher content of the same strain grown at Avon than at Fort Collins. The application of commercial fertilizers had little effect on the yield of flowers or pyrethrins. A comparison of the yield of flowers and pyrethrin in 25 foreign and domestic strains of pyrethrum failed to reveal any outstanding strains or plants. Immature or nearly mature flowers retained their pyrethrin content during storage better than overmature blossoms. There was only slightly more decomposition of pyrethrins in uncompressed flowers than in those baled under 8 tons' pressure. On the whole the investigation showed the desirability of growing pyrethrum in high-altitude regions of the State.

Pyrethrum plant investigations in Colorado, III, IV, L. E. Evans, C. B. Gnadinger, and C. S. Corl (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 205–209*).—Two papers are presented.

III. *Effect of spacing interval in the row on yield of flowers.*—With the distance between rows uniformly 30 in., six spacings in the row, namely, 9, 12, 15,

18, 21, and 24 in., were compared by the Colorado Experiment Station. The 9-in. spacing gave the greatest yield in pounds of dry flowers, and significantly greater than at either 18, 21, or 24 in. The mean number of flowers per plant was significantly greater in the 21- and 24-in. spacings than at 9 or 12 in. Close planting tended toward upright stems with a decreased tendency to spread and lodge as compared with 18-, 21-, and 24-in. spacing.

IV. *Effect of different irrigation practices on plant losses due to crown rot.*—Observing that pyrethrum plants growing at Fort Collins, Colo., were sometimes affected by gradual decay of the epidermal tissues of the crown stalk and that the greatest losses occurred where the moisture was excessive in the surface soil, a preliminary study was made in 1933 and 1934 by the station of various irrigation methods as a means of reducing losses. It was found that the losses due to crown rot could be reduced under irrigated and similar conditions if the irrigation furrows were 6 to 8 in. deep and placed at a distance of from 10 to 15 in. from the plants. It was also important that the surface soil be kept dry near the plants during irrigation. The maximum losses sustained both years were with shallow furrows 3 to 5 in. deep and 4 to 5 in. from one side of the row and with no ridging.

Growth experiments with pin oaks which are growing under lawn conditions, D. Wyman ([*New York*] *Cornell Sta. Bul. 646 (1936), pp. 23, figs. 2*).—Applications ranging from 5 to 100 lb. of sulfate of ammonia per 1,000 sq. ft. of lawn indicated that if the applications were made in March before the grass had begun its growth amounts as high as 50 lb. could be used on soils such as employed without injury.

Pin oaks, part planted on November 1, 1930, and part in the spring of 1931, were fertilized with sulfate of ammonia or Ammo-Phos applied in crowbar holes surrounding the trunks. The time of planting had a marked effect on survival, approximately twice as many trees being killed or injured in the fall as in the spring groups. As to the manner of planting, careful methods in which the soil at the bottom was loosened, the roots placed, and the soil firmed with the feet were found more important in spring than in autumn plantings. Pruning trials showed higher mortality among trees left unpruned at the time of transplanting than for pruned trees. Trees with branches left along the trunk made significantly more growth in their second and third years than those pruned of all lower branches.

Fertilizer applied in split amounts to young pin oaks proved safer than single applications. Nitrogen and phosphorus in the form of Ammo-Phos produced greater growth than did nitrogen alone. When increases in caliper growth were greater than 0.5 cm per year there was a high correlation between diameter increment and twig elongation. In a group of unfertilized trees large growth one year was not necessarily correlated with large growth the next.

FORESTRY

Root growth of seedlings of Pinus echinata and Pinus taeda, L. M. Turner (*Jour. Agr. Res. [U. S.], 53 (1936), No. 2, pp. 145–149, figs. 2*).—Employing glass-sided frames which permitted observation of root development, the course of growth of roots of 1-yr. shortleaf and loblolly pine seedlings set in the boxes on April 1, 1933, was followed by the Arkansas Experiment Station over a period of 2 yr. The roots of both species made measurable growth during every 8-day period during the 2 yr. Periods occurred in which there were both greater average daily increment to each root and a larger number of

growing roots. These periods of more active development occurred in early spring and late summer-early autumn and one year in midautumn. Periods of very little growth characterized as semidormancy occurred from December 1 to March and from the end of June through August. Lessened activity was associated in the two periods with low air temperature and low rainfall, respectively. Maximum activity was associated with considerable rainfall and favorable but not too high air temperatures. Whenever the mean temperature of the air was 53° F. or lower, high rainfall had no accelerating effect on root growth at any soil level. In general the effects of both low temperature and low rainfall were more evident in the top soil layer than lower down.

Rate of formation of heartwood in southern pines, E. L. DEMMON (*Jour. Forestry, 34 (1936), No. 8, pp. 775, 776, fig. 1*).—On the basis of studies conducted with longleaf and slash pines grown in Florida, loblolly pine from Virginia, North Carolina, and South Carolina, and shortleaf pines from Arkansas, the author concludes that heartwood does not begin to form in southern pines until the trees are from 15 to 20 yr. old and that shortleaf and loblolly pines contain much smaller proportions of heartwood for similar aged trees than do longleaf and slash pines. Turpentining tended to increase the proportion of heartwood.

Air temperature in relation to fire cost and damage, L. G. GRAY (*Jour. Forestry, 34 (1936), No. 8, pp. 779–785, figs. 2*).—Pointing out that temperature is a fundamental control of relative humidity (usually bearing an inverse relationship to it), and that temperature is also related to evaporation, precipitation, and wind movement, the author correlates temperature with fire data for all the California national forests combined and suggests that on a long-time basis there is an interesting, useful, and partial correlation between air temperature and economic fire factors.

Measuring fire weather and forest inflammability, H. T. GISBORNE (*U. S. Dept. Agr. Circ. 398 (1936), pp. 59, figs. 16*).—Pointing out that the five principal causes of forest fire hazards, aside from human activities, are (1) the character and volume of forest fuels, (2) topography, which influences the exposure of the fuels and rate of spread of fire, (3) lightning, (4) wind, and (5) current moisture content of the fuels as determined by precipitation, temperature, humidity, solar radiation, and soil moisture, the author discusses various ways and means of measuring weather factors and inflammability. Among equipment, the construction and operation of which are considered, are rain gages, thermometers, thermographs, psychrometers, hygrographs, anemometers, wind direction instruments, and implements for determiuing fuel moisture. For integrating the effects of various factors there was designed a small cardboard device known as the Rocky Mountain fire danger meter. In a discussion of record keeping methods the author outlines correct use of cardboard report forms, the making of charts and tabulations, ways of localizing weather forecasts, the estimation of current hazards, and the making of fire danger comparisons.

The "Big Woods" of Minnesota: Its structure and relation to climate, fire, and soils, R. F. DAUBENMIRE (*Ecol. Monog., 6 (1936), No. 2, pp. 233–268, figs. 6*).—This is a general discussion based on observations and intensive studies of typical small areas.

A cubic volume table for eastern red cedar, W. MAUGHAN (*Jour. Forestry, 34 (1936), No. 8, pp. 777, 778*).—On the basis of measurements of 107 trees selected at random from 16 stands distributed on various soil types, the author presents a table for the eastern cedar (*Juniperus virginiana*).

DISEASES OF PLANTS

The Plant Disease Reporter, August 15, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), No. 15, pp. 229–246, figs. 4*).—Among other items noted, the following are of current interest: Observations on plant diseases in Washington State during 1936, by L. K. Jones; plant diseases in Massachusetts [1936], by O. C. Boyd; a *Coniothyrium* disease of peonies, by M. R. Harris; *Diplodia natalensis* attacking *Pandanus javanicus variegatus* in Alabama, by G. W. Carver; root infection and die-back in plums associated with *Valsa leucostoma* in New Jersey, by R. P. White; current data on Dutch elm disease eradication; sore shin of tobacco in Kentucky, by E. M. Johnson; and weather conditions and bacterial wilt of corn in Michigan and Indiana, by N. E. Stevens.

[Phytopathological studies by the Arizona Station] (*Arizona Sta. Rpt. 1935, pp. 16, 67, 76–86, figs. 3*).—Reports of progress are given on the following projects: The effects of lime spray on the foliage (chlorosis) of citrus; spraying for fungus rot of date fruits; pecan rosette; incidence of angular leaf spot of cotton, and the susceptibility of the Acala variety; the control of Texas (cotton) root rot, and the prevalence, distribution, sclerotium formation, and resistance of other hosts to the fungus (*Phymatotrichum omnivorum*); galls on alfilaria (*Erodium cicutarium*), due apparently to *Synchytrium papillatum*; carrot diseases; psyllid yellows and early blight of potatoes; cooperation with seed-potato growers in production of certified seed; incidence of the curly top virus in hosts other than beet and tomato; heart rot of the umbrella tree (*Melia azedarach*); blights of date inflorescence due to *Fusarium* spp. and to *Helminthosporium* sp.; leaf spot of date palms due to *Graphiola phoenicis* and its control; ash canker; *Cytospora* canker of apricot; *Alternaria* leaf blight of flax; bacterial slimy rot and fungus diseases of lettuce; crown gall on *Libocedrus decurrens*; the effect of temperature on the growth of crown gall; and the control of root knot by the use of nematode-resistant crops.

[Phytopathological studies by the Kentucky Station] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 27–30, 31, 46, 47*).—Notes are given on observations and studies relative to tobacco diseases (including the incidence of black shank, anthracnose, and wildfire; *Physalis subglabrata* as a wild host of the angular leaf spot organism and its insect transmission; and virus diseases), apothecial development in *Sclerotinia trifoliorum* and *S. sclerotiorum*, anthracnose resistance of red clover, alfalfa failure (cause undetermined), and spraying raspberries for anthracnose.

[Phytopathological studies by the Tennessee Station] (*Tennessee Sta. Rpt. 1935, pp. 37, 39–42, 49*).—Reports of progress are given on the following: Resistance of Hopi lima beans and pole snap beans to nematode injury, by B. D. Drain; breeding and selection of wheat for disease resistance, with special reference to head blight and root rot, *Fusarium* wilt of cotton and tomato, strawberry seedlings and hybrids tested for resistance to black root, control of tomato leaf spots, and anthracnose-resistant red clover, all by C. D. Sherbakoff; and strain tests of tobacco for root rot resistance at the Tobacco Substation at Greeneville, by F. S. Chance.

Cellular immunity, J. Dufrénoy (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 70–79, figs. 6*).—In this general account three grades of resistance or susceptibility, based on cytological evidence, are noted and described as follows: (1) In extremely susceptible hosts, adjustment of the host-parasite relation is so delicate that at least in the initial infection stages the metabolism of infected cells is scarcely interfered with. This is true for most systemic diseases. (2) In

moderately susceptible hosts, invasion results in a mobilization of starch and protein. As the starch grains disappear from within the plastids the latter revert to the original mitochondria. As water-soluble materials accumulate in the vacuoles the "aggregation" aspects may be featured, cytoplasmic strands partitioning off the vacuoles as the solution within becomes richer. Thus both the mitochondria and the vacuoles revert to the condition typical of embryonic cells, and the latter, actually reverting to the meristematic condition, may resume growth and eventually divide. (3) In highly resistant hosts, the parasite kills the cells as soon as penetration is initiated. The death of some of the cells alters the metabolism of the surrounding cells, so that their cell sap becomes very rich in phenolic compounds, a condition uncongenial for the pathogen.

"Running out" of plants: A developmental-historical study of the senility and propagation problem, F. Ragaller (*Der Abbau: Eine entwicklungsgeschichtliche Studie zum Senilitäts- und Fortpflanzungsproblem. Jena: Gustav Fischer, 1934, pp.* [5]+85, *figs. 3*).—This monograph on running out in plants defines the term and, beginning with the work of H. Morstatt (1925), exhaustively treats of its relations to degeneration (minus mutations and bud variations); to decline (aging), methods of propagation, and the senility theory (asexual or vegetative propagation, sexual or generative propagation, and the significance of vegetative and generative propagation in the life of the higher plants); to adaptation; and to diseases.

It is finally concluded that running out constitutes only a small section of a complex and interrelated series of problems, and that its full elucidation will come from a grasp of the whole perplexing congeries of individual questions as clarified by a comprehensive study of their interrelationships with biology as a whole. Running out in itself is to be regarded as a collection of questions in ecology, in decline, and in disease, all brought together in one problem.

The dispersal of viable basidiospores of the Gymnosporangium rusts, J. D. MacLachlan (*Jour. Arnold Arboretum, 16 (1935), No. 4, pp. 411–422, figs. 2*).—The results of airplane collections of spores over infected cedar areas in Massachusetts and of laboratory tests on the duration of viability with respect to time, temperature, and humidity factors indicated that viable basidiospores of *G. juniperi-virginianae* are present in the air during rainy periods in early May at altitudes of at least 2,000 ft. and that they can live for many days under the conditions prevailing during their normal dispersal.

Experience has shown that eradication of red cedars within a radius of from 1 to 2 miles will usually protect pomaceous hosts from injurious infection with the *Gymnosporangium* rusts, and certain factors influencing the efficiency of this means of control are presented.

The hosts, life history, and control of Gymnosporangium clavipes C. and P., I. H. Crowell (*Jour. Arnold Arboretum, 16 (1935), No. 4, pp. 367–410, pls. 6, figs. 3*).—In this monographic account of the species, the author lists its pomaceous (11 genera) and *Juniperus* (8 species and varieties) hosts with their taxonomic positions, geographic ranges, and symptomatology, and gives the detailed results of life history studies of the fungus and of control measures applicable on both the pomaceous and *Juniperus* hosts and of preliminary studies of the period of susceptibility of the pomaceous hosts.

On pomaceous hosts the disease occurred most frequently on the fruits, less so on the twigs and buds, and rarely on the leaves, and it was most severe on the fruits, twigs, and buds. On the *Juniperus* hosts it was most abundant on twigs from 1 to 5 yr. old, but was found also on the leaves, branches, and trunks. It was perennial on the twigs, branches, and trunks of *Juniperus*.

The life history of the aecial phase was essentially the same on fruits and twigs. It developed more slowly on the leaves and fruits of very resistant hosts. In forced buds the mycelium was essentially systemic and developed spermagonia (rarely aecia) progressively as the buds elongated. The mycelium of the telial phase was confined to the epidermis and to the phellogen of the twigs, branches, and main trunk of the *Juniperus* hosts. It remained in the leaves for from 1 to 2 yr. and was perennial for several years in the twigs, branches, and main trunk. Telia were produced annually.

Recommendations for control are along the lines of selective plantings, eradication of hosts, removal of infected parts from both host groups, removal of infections from the trunks of red cedars, and spray applications on both host groups. Of the fungicides tested, Linco colloidal sulfur gave very promising results.

Studies on Nipponese Peronosporales.—IV, The relation of the environmental factors and the treatment of oospores to the infection by oospores of Sclerospora graminicola (Sacc.) Schroet., H. TASUGI (*Jour. Imp. Agr. Expt. Sta., Nisigahara-Mati, Tokyo, Japan, 2 (1935), No. 4, pp. 459–480, figs. 3; Eng. abs., pp. 478–480*).—In the previous papers of the series[3] the author reported studies of some of the physiologic characters, the life history, and the pathogenicity of *S. graminicola*, and of four physiologic forms. The present study indicated infection to be most vigorous at soil temperatures of from 20° to 21° C., while the minimum and maximum were from 12° to 13° and 30°, respectively. Thus the degree of oospore infection in the field may vary according to the time of seed sowing. The highest percentage of infection occurred at pH 5.20, with increase it became gradually less, and at pH 8.14 only 15.96 percent occurred. At 80 percent soil moisture infection was greatest, decreasing in amount above or below this figure. A moisture content of 40 percent was insufficient for germination of either seeds or oospores. The depth at which infected seeds were sown had no significant relation to oospore infection. When seeds and oospores were at the same soil level infection was most vigorous, less so when oospores were above the seeds, and least vigorous when oospores were below the seeds. It is thus considered that penetration by the oospore germ tube occurs through the young shoot rather than through the roots.

Hot water treatment of oospores at 50° for from 1 to 4 hr. gave excellent results, while at 55° no infection at all occurred. Dry heat at these temperatures failed to give significant results. With treatment by mercuric chloride for from 0.5 to 1 hr., no infection occurred with the use of concentrations above 0.01 percent. With formaldehyde at 0.1 and 0.25 percent acting for 4 and from 1 to 4 hr., respectively, no infection followed. Copper sulfate or limewater proved unsatisfactory.

Contribution to the rust problem, [I], II [trans. title], E. SCHILCHER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 43 (1933), No. 8–9, pp. 533–563, figs. 4; 45 (1935), No. 6–7, pp. 316–335, figs. 5*).—Two papers are included.

The first paper states that the treatment of brown rust (*Puccinia triticina*) of wheat with calcium cyanamide exerted a favorable action on the infection by this rust. The depth and thickness of seeding or the time of cultivation appeared to exert no influence on infection during the experiments of 1929. Potassium and phosphorus retarded, while nitrogen stimulated, rust develop-

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[3] Jour. Imp. Agr. Expt. Sta., Nisigahara-Machi, Tokyo, Japan, 2 (1933), No. 2, pp. 225–262, pls. 3, figs. 6; Eng. abs., pp. 257–261; 2 (1934), No. 3, pp. 345–366, fig. 1; Eng. abs., pp. 364–366.

ment. The amount of commercial fertilizer used exerted no definite effect. The time of appearance, intensity, and kind of rust infection generally depended on the temperature and humidity conditions during the experiment. On the basis of greenhouse tests, only forms XIII, XIV, XV, and XXI were isolated from the material collected in Austria.

In the second paper it is stated that the occurrence of biologic forms of *P. triticina* in Austria was determined for 1932, 1933, and 1934. Form XIII was by far the most common type, and form XV was the only other type consistently collected. Forms XIV, XVI, XX, and XXI were found infrequently, and are considered to be of only sporadic occurrence in the area. Four climatic types occurring in the area studied (oceanic, subalpine, alpine, and continental) appeared to have consistent effect in determining the relative prevalence of different forms and also the intensity of infection during years of severe rust infection, as well as during 1 yr. when the disease was much less injurious. No cultivated varieties of wheat grown in the area showed any important resistance to brown rust. Both brown rust and yellow rust (*P. glumarum*) showed a variation of a full month in the outbreak of their spring infection in different years. A delayed infection was followed by a decrease in rust damage. During mild rust years susceptible wheat varieties appeared as though resistant.—(*Courtesy Biol. Abs.*)

The incidence and distribution of biological races of yellow rust (Puccinia glumarum) in 1934 [trans. title], W. Straib (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 3, pp. 455–466*).—In 74 localities (1934) within and outside of Germany 114 yellow rust tests were carried out, and from them 169 single-spore strains were obtained. From the latter 14 biological races were demonstrated, and among them 3 new races designated as Nos. 23, 24, and 25. In the new races 23 and 24, found in the Netherlands, Germany, or France, there occurred biological forms which were especially aggressive on barley but which attacked wheat only to a limited extent. Therefore, it became possible to test once more the "formae speciales" of J. Eriksson for the "barley" yellow rust. Such a test indicated that today Eriksson's conception of formae speciales for this rust must fall, and especially in view of the fact that there are yellow rust races which are only weakly aggressive for barley as well as for wheat. Thus their classification under the old formae speciales was not possible.

The year 1934 was characterized by a further diffusion of race No. 7 in Germany, while almost all the other races occurred only sporadically in the various countries under observation. Greater shifts in the distribution of races in recent as compared with earlier years have scarcely taken place. The spread of race No. 7 was made possible by the widespread sowing of wheat varieties with no summer resistance to this race. The dry year 1934 thus indicated very forcibly the selective action of these wheat varieties on the flora of the yellow rust races.

The yellow rust susceptibility and resistance of barley varieties [trans. title], W. Straib (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 3, pp. 467–481*).—The seedling susceptibility to 13 biological races of yellow rust (*Puccinia glumarum*) was tested in the greenhouse, using 185 barley varieties (27 winter and 158 summer forms) belonging to different species of *Hordeum*. Races of rusts from various countries were employed, whose behavior on wheat had previously shown them to differ widely. The 2 races Nos. 23 and 24, isolated in 1934 as noted above, proved to be most infectious for cultivated barley, only a few of the 185 varieties proving either resistant or immune. On the other hand, the barley varieties tested were very preponderantly immune, highly

resistant, or only to a limited extent susceptible to any of the other yellow rust races used.

Among the *Hordeum* species as a whole no uniformity of behavior was observable, susceptibility and resistance being distributed about equally.

Of the distinct selections, the summer barley varieties Ackermanns Bavaria, Heils Franken, and Heines Hanna were prominent for their resistance to race No. 23, which is widely distributed in Germany and the Netherlands, as also for their immunity to the "wheat" yellow rust races as a whole, but they proved to be susceptible only to the "barley" race No. 24 found in France.

A variety of *Hordeum vulgare pallidum* proved immune to 25 known yellow rust races.

Infection tests with biological races of yellow rust on grasses [trans. title], W. STRAIB (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 3, pp. 483–497*).—In the grass infection tests here recorded, the host range of different races of yellow rust corresponding to the old "formae speciales" *tritici* and *hordei* was further defined and exhaustively tested, using 227 grass species inoculated with 3 biological races of *Puccinia glumarum* (No. 24 corresponding to form *hordei*, No. 2 to form *tritici*, and No. 18 occupying an intermediate position). The results indicated that there are no essential differences in the infection relations of the 3 races on the different grass genera justifying a retention of the formae speciales. Gradual distinctions were demonstrable only among the species and the next lower systematic units. The individual grass species and varieties almost as a whole can serve as hosts during every season and in different countries to all the known races of yellow rust (20 races tested).

The previous infection range of yellow rust was confirmed and extended, and a list of 16 successfully inoculated genera is presented, together with a detailed tabulation of all the species tested.

Irradiation of plant viruses and of microorganisms with monochromatic light.—III, Resistance of the virus of typical tobacco mosaic and Echerichia coli to radiation from λ3,000 to λ2,250, Å, A. HOLLAENDER and B. M. DUGGAR (*Natl. Acad. Sci. Proc., 22 (1936), No. 1, pp. 19–24, figs. 3*).—Continuing this series (E. S. R., 71, p. 482), the destruction spectrum of a highly purified suspension of the virus of typical tobacco mosaic as compared with the destruction spectrum of *E. coli* in the same suspension is described for from λ2,250 to λ3,000 a. u. It has been found that at λ2,250 a. u. the amount of energy which is necessary to destroy 50 percent of the virus in 1 cc is only one-fifth the amount required at 2,650 a. u., whereas the energy necessary to inactivate bacteria is greater at λ2,250 a. u. than at 2,650 a. u.

The behavior of micro-organisms in the presence of certain dyes, with special reference to malachite green and its eventual application in phytotherapy [trans. title], O. VERONA (*Bol. Sez. Ital., Soc. Internaz. Microbiol., 7 (1935), No. 11, pp. 426–428*).—Many dyes tested had little or no bactericidal action, but malachite green exhibited a strong inhibitory action, brilliant green a moderate one, and gentian violet acted only feebly. The action of the first dye was noted at 1:500,000 and 1:750,000, and at 1:100,000 it prevented spore germination in *Tilletia* and *Ustilago* species and zoospore formation in *Plasmopora viticola*. On the other hand, the germination of seeds of graminaceous and leguminous plants was somewhat stimulated rather than decreased by a 6-hr. treatment at 1:10,000, and promising results in seed disinfection are reported.

Some physicochemical properties of fluid insecticides and fungicides [trans. title], S. HENIN (*Rev. Path. Vég. et Ent. Agr. France, 22 (1935), No. 3,*

pp. 209–216, fig. 1).—This discusses the superficial tension, viscosity, fluidity, and rigidity of sprays, together with their measurement, with special reference to the relation of these properties to the effectiveness of spray treatments.

The fungicidal properties of certain spray-fluids.—XI, Synthetic solvents, H. MARTIN and E. S. SALMON (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 3, pp. 469–490*).—Continuing this series (E. S. R., 71, p. 331), the fungicidal (lethal to the fungus) and phytocidal (injurious to the leaf) properties of manufactured hydrocarbons and their simpler hydroxyl derivatives and esters were examined by application in spray form to young leaves of hops bearing the powdery patches of the hop powdery mildew (*Sphaerotheca humuli*), the sprays being prepared by agitation with 0.25 percent Agral I solutions. These properties are reported for the following materials: Benzene and its hydrogenation products, cymene and various terpenes, the lower aliphatic alcohols, the phenols, phenolic acids, miscellaneous phenolic derivatives, and various esters.

In the case of cymene, carvene, and ethyl oleate, but not with dimethyl cyclohexanyl oxalate, the sprays prepared with 0.13 percent sodium oleate as the emulsifier proved less active fungicidally and phytocidally than sprays of similar oil concentration emulsified with Agral I. It is suggested that these differences may be associated with the amount of oil remaining on the leaf after spraying, and that this in turn may be influenced by the stability of the emulsion.

The physical chemistry of bordeaux mixture: Adhesiveness as a swelling phenomenon [trans. title], P. RECKENDORFER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45* (*1935*), *No. 6–7, pp. 341–353, figs. 2*).—The author discusses the relationship between colloidal swelling phenomena and the sticking qualities of such particles. By means of newly developed apparatus (to be described elsewhere), automatic records were made of the rate and final amount of swelling of bordeaux mixture particles resulting from additions of 1, 1.5, or 2 parts of calcium oxide to 1 part of $CuSO_4$. The precipitated colloids of these three mixtures showed swelling ratios of 6:1:3, respectively. There is presented a physicochemical explanation, together with a physical reaction formula derived from the observed data.—(*Courtesy Biol. Abs.*)

Tests of various arsenic preparations as dust fungicides [trans. title], A. P. VASIL'EVSKIĬ (WASSILIEWSKY) (*Trudy Nauch. Inst. Udobr. i Insektofungisid.* (*Trans. Sci. Inst. Fert. and Insectofungicides* [*Moskva*]), *No. 123* (*1935*), *pp. 140–143, figs. 2; Ger. abs., p. 286*).—In tests with iron, calcium, and sodium arsenites as fungicides against cereal smut, good results were obtained by calcium arsenite with 10 percent As_2O_3 and by sodium arsenite with 5 percent As_2O_3. Of a series of organic arsenic compounds tested, methyl sulfide of arsenic and phenyl oxide of arsenic gave good results without lowering yields.

Transit and storage diseases of fruits and vegetables as affected by initial carbon dioxide treatments, C. BROOKS, C. O. BRATLEY, and L. P. McCOLLOCH (*U. S. Dept. Agr., Tech. Bul. 519* (*1936*), *pp. 24, fig. 1*).—The methods used in this study were similar to those previously noted (E. S. R., 68, p. 203). The results of short-period CO_2 treatments are here reported in detail for more than 40 different fruit and vegetable products.

Decidedly favorable results followed CO_2 treatments of sweet cherries, plums, peaches, Bartlett pears, raspberries, dewberries, blackberries, figs, grapefruits, and oranges. Initial treatments at the temperatures commonly prevailing in freshly loaded refrigerator cars usually had as favorable an effect in retarding decay and in holding the firmness of the product as immediate storage at 32° F. Most of the products mentioned were exposed for 2 days to relatively high percentages of CO_2 without injury to flavor, but a few failed to withstand such prolonged treatment. On oranges and grapefruits *Penicillium digitatum* and

P. italicum were held in check better than *Diplodia natalensis* or *Phomopsis citri*. With products other than those mentioned the results were less conclusive or definitely objectionable. Treatment delayed the development of *P. vexans* from eggplant and of *Sclerotium rolfsii* and *Rhizoctonia solani* on beans, but not that of *Colletotrichum lindemuthianum* or *Bacillus carotovorus* on beans. The CO_2 treatment appeared to improve the flavor of honeydew melons, avocados, and papayas, and to decrease the bitterness of iceberg lettuce. The freshness of asparagus appeared to be maintained as well by exposure for from 18 to 24 hr. to from 25 to 30 percent of CO_2 at from 60° to 70° F. as by immediate storage at 32° or 40°, but more severe treatments sometimes affected the flavor of the tips. Initial CO_2 treatments held carrots in as sweet and fresh a condition as immediate storage at 32°, and had a decided inhibitory effect on decay by *Sclerotinia sclerotiorum* and *Rhizoctonia* sp., but not on decay by *B. carotovorus*.

Researches on internal disinfection of barley seeds in the control of Ustilago nuda (Jensin) Rostrup, P. Dieudonné and R. Vanderwalle (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 4 (1935), No. 4, pp. 366–377; Dutch, Ger., and Eng. abs., pp. 376, 377*).—Hot water treatments (1933–34) without presoaking proved ineffective, even at 53°–54° C. A relation was found between the duration of the presoaking and that of the treatment, 2 hr. of soaking at 25° being effective with 30 min. of treatment at 50°, or with 5 min. at 52°, but not with 15 min. at 50°. Three hr. of soaking followed by 10 min. of treatment at 50° was also effective.

By adding 4 percent of alcohol to the soaking bath, disinfection was obtained by 3 hr. of soaking at 25° and by treatment for 20 min. at 45°, but the vitality of the seeds was seriously impaired. Good disinfection was obtained by soaking for 2 hr. in water at 45°, but the germinability was greatly lowered. By adding 0.5 percent of alcohol, disinfection at 45° was obtained in 60 min., but again the germinability was seriously lowered.

The toxic action of some chemical compounds on Tilletia tritici as a measure of permeability [trans. title], S. Hermann and R. Neiger (*Zentbl. Bakt.* [etc.], *2. Abt., 93 (1935), No. 5–8, pp. 137–141*).—As a result of tests here reported it is concluded that the physiological method in permeability studies appears applicable to the special relations of cell chemistry, and that toxic action, as measured by the rigidity or death induced in an organism, offers a serviceable measure of permeability. The toxicity of chemical substances depends in high degree on their ability to call forth secondary reactions. Agents which enter into combinations with protein, or in the special case of *Tilletia* with trimethylamine, form a protective covering on account of the precipitate. Thus not penetrating into the interior, they may be washed out again, and the toxic action consists merely of a reversible hardening of the cell. Poisons which form insoluble compounds with neither protein nor trimethylamine, e. g., salicylic acid, lead to death of the cell, and their action is irreversible. By a combination of substances of the first type (forming insoluble precipitates) with those of the second (not forming insoluble precipitates), the latter also become capable of being washed out, and the process is thus rendered reversible.

A consideration of these and similar reactions is suggested especially in relation to the testing of fungicides and bactericides, since otherwise the conclusions arrived at may be erroneous.

On the physiology of Typhula graminum, Karst., H. Tasugi (*Jour. Imp. Agr. Expt. Sta., Nisigahara-Mati, Tokyo, Japan, 2 (1935), No. 4, pp. 443–458, pls. 2, fig. 1; Eng. abs., pp. 457, 458*).—Continuing this series (E. S. R., 67, p. 408), a study of the relations of the fungus to culture media and environmental conditions gave the following results: Best growth of the fungus oc-

curred at from 8° to 15° C., the minimum was somewhat below −5°, and the maximum was from 22° to 23°. Sclerotial production was most abundant at from 0° to 21°. Vegetative growth was most vigorous at pH 7, and sclerotial production was most abundant at from pH 5 to 6. Normal fruiting bodies developed only under diffuse light or that passed through vitaglass. No normal hymenia or basidiospores were produced in the dark or under filtered light. The shorter wavelengths had a strong inhibitory effect on fruit-body development.

From these results the author believes it probable that under the snow, through which only the longer wavelengths of light can reach the soil, the sclerotia may produce, instead of the normal fruit bodies, mycelia which creep along the soil and invade the young host plant, producing the snow mold disease.

New cases of Verticillium tracheomycosis in Italy: Observations on a new species of vascular Verticillium [trans. title], G. Goidànich (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 15* (*1935*), *No. 4, pp. 548–554*).—This paper comprises notes on vascular infections by *Verticillium*, with particular reference to *Ulmus campestris*, *Robinia pseudoacacia*, *Cercis siliquastrum*, *Sophora japonica*, *Ailanthus glandulosa*, and to the recently described *V. amaranthi* infecting *Amaranthus tricolor*, which is believed to be identical with *V. alboatrum*.

Studies on the pathology of hops and potatoes [trans. title] (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Československ.* (*Rec. Trav. Insts. Rech. Agron. Répub. Tchécoslov.*), *137* (*1935*), *pp. 49, pls. 9; Ger. abs., pp. 12–17, 20, 23–25, 30–32, 37, 38, 41, 42, 46, 47*).—The following papers are included:

Infectious sterility of hops, C. Blattný and V. Vukolov (pp. 3–18).—This discusses the characteristics and differential diagnosis of the disease. Experimental data indicated no relations to plant nutrition, soil conditions, or water economy, and it was not transmitted in tests with sap, insects, or soils, but in all cases the disease was carried over from affected to healthy parts by vegetative propagation.

The "string of pearls" disease of hop roots, C. Blattný and V. Vukolov (pp. 19, 20).—In certain 2-year-old hop collections about 20 percent of the plants were found to be affected by a condition under which the roots (particularly the taproots) became abruptly and successively thickened and attenuated, giving the appearance of a string of beads (whence the name applied to it by the authors). On the basis of the observational and histological data presented, it is believed that the abnormality resulted from the penetration of the root through the soil, which offered a varying resistance to the growing root.

Contribution to the knowledge of Spongospora subterranea, C. Blattný (pp. 21–25).—This records local data on the distribution of potato scurf, varietal relations, disease manifestations in the tubers, roots, and stems, etc.

Contribution to the knowledge of gray necrosis of the flesh of potato tubers, C. Blattný (pp. 26–32).—All attempts at transmission of the condition gave negative results, appearing to indicate that it has no relation to any known virus disease. No injurious effects on the yield were noted.

A study of the hill selection method on the potato varieties "Prager Hörnchen" and "Blauäugige", C. Blattný (pp. 33–38).

Contribution to the therapy of the virus diseases of potatoes, C. Blattný (pp. 39–42).—Cut halves of tubers from plants affected by various virus diseases were treated with different chemicals, the other halves left as controls, and the progeny of both lots followed with respect to yields and disease conditions. No significant or permanent results were obtained.

Experiments on the influence of irrigation and time of planting on the health condition of the potato, C. Blattný (pp. 43–47).—In the potato variety "Erst-

lingen" irrigation was associated with a masking of the symptoms of virus diseases, a decrease in the number of leaf aphids, and a lessening of the spread of virus diseases. It thus appears possible by irrigation in the lowlands to better maintain a healthy condition in seed potatoes. Experiments also gave good results in the control of aphids by the intensive repeated application of sprays and dusts.

In experiments in which the halves of potato tubers were planted, respectively, in the spring and in the summer, the spread of the virus diseases was much less in the later planting, and this decrease was directly correlated with a strikingly lower average incidence of aphids on the summer (56 per plant) as compared with the spring planting (289 per plant). It thus appears possible by summer planting of the Erstlingen variety in the lowlands to better maintain a healthy condition in the seed tubers.

The wasting disease of Zostera marina.—I, A phytological investigation of the diseased plant, C. E. Renn (*Biol. Bul., 70 (1936), No. 1, pp. 148–158, figs. 7*).—*Labyrinthula* (a rhizopod protozoan) appears to be universally associated with the epidemic condition under study, and histological examination and inoculation tests indicated its true parasitic nature for eelgrass. The rapidity with which it produced infection was commensurable with the aggressive nature of the spontaneous disease. The appearance of mycelium of *Ophiobolus* several days after invasion by *Labyrinthula* suggested a possible secondary role for the fungus, and until this question is definitely settled by inoculation tests in the more northern waters the alternative of two active parasites must be considered. However, the data at hand led the author to consider that the fungus is not a true parasite.

From its behavior the *Labyrinthula* appears to be a specific parasite of *Z. marina*, but until its life history has been studied more fully it is deemed unwise to constitute a new species.

Ecological factors in north Texas related to the 1935 stem rust epidemic, I. M. Atkins (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 93, pp. 31–41, figs. 3*).—It is stated that no one factor of weather or condition of the crop was responsible for the epidemic. All the factors studied contributed their respective parts and, because of the manner in which they were associated, resulted in one of the most severe rust epidemics in history in spite of the reduction in the acreage of wheat in north-central Texas by winterkilling. Under the existing conditions (including thin stands, late maturity of the crop as a result of thin stands, excessive precipitation, high humidity, favorable temperatures and humidity for rust development, frequent dews, cloudy weather, and favorable winds to carry the rust spores to other localities and States), the epidemic in Texas served as a source of inoculum for an extremely long period of time and thus contributed to the epidemic in other States.

New high yielding rust resistant varieties of winter wheat [trans. title], A. A. Starkov (*Selek. i Semen., No. 2 (1936), pp. 66–68*).—Breeding and selection results (1933–35) are described.

Experiments on the control of halo blight of beans [trans. title], K. Böning (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz, 13 (1935–36), No. 9–10, pp. 252–260*).—In tests with fungicidal dusts and sprays (including copper and organic mercury preparations), the treated plants gave a 2-yr. average of about four-fifths higher yields of sound beans than the untreated. Favorable results were also obtained by seed treatments with Ceresan and with hot water (45° C. for 30 min. and 50° for 10 min.). No conspicuous practical effects on the disease were evidenced by the fertilizer tests reported.

The results of varietal susceptibility tests are also recorded.

The nature of resistance of flax to Melampsora lini, E. G. SHARVELLE (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 2*, *pp. 81–127*, *figs. 12*).—According to this contribution from the Minnesota Experiment Station, flax may be immune, highly resistant, resistant, incompletely susceptible, or completely susceptible to rust (*M. lini*), designated as classes 0, 1, 2, 3, and 4, respectively. Histological studies of uredial types characteristic of these five classes of reactions indicated that the physiology of the host may influence its resistance or susceptibility. Flax plant extracts supported vegetative growth of urediospores in correlation with the resistance or susceptibility of the varieties from which they were obtained.

No gross anatomical features of the plant were considered as operating alone in the determination of resistance, but the thickness of the epidermal membrane of leaves and stems of different varieties may be of considerable importance in uredium formation and urediospore liberation. The resistance of the epidermal membrane to puncture was correlated with the possession of a cuticle, the development of a hypodermis, and the isodiametric shape of the epidermal cells. In general, the susceptible varieties lacked a well-developed epidermis, the epidermal cells were rectangular, and the hypodermis was usually absent. The size, shape, and arrangement of the cortical fibers could not be correlated with rust resistance. Certain susceptible varieties possessed a larger number of stomata, which may be significant in influencing the percentage of germ-tube penetration. Stomatal movements may account for some differences in apparent resistance, e. g., in the Bison variety (resistant in the field) the stomata open only after the dew has disappeared from the leaves.

Soil infection with *Fusarium lini* may account for the absence of rust on flax in wilt-sick soil, possibly because of the atrophy of the guard cells and consequent failure of the stomata to function. Darkness during the incubation period apparently suppressed rust development, this being possibly correlated with stomatal movements. Application of excess nitrogen and phosphate increased rust development in normally resistant varieties. Excess potassium appeared to suppress it somewhat.

It is concluded that rust resistance in cultivated flax cannot be attributed to any one factor alone, but must be considered due to a number of factors operating together.

A virus disease of lupines [trans. title], D. SPIERENBURG (*Tijdschr. Plantenziekten*, *42* (*1936*), *No. 3*, *pp. 71–76*, *pls. 2*).—A virus disease of lupines is described in which dark stripes and spots appear on the stems, the leaves become wrinkled or violet brown, and the tops finally die.

Soils in relation to marsh spot of pea seed, B. S. FURNEAUX and H. H. GLASSCOCK (*Jour. Agr. Sci.* [*England*], *26* (*1936*), *No. 1*, *pp. 59–84*, *figs. 4*).—The soils of 167 fields in which green peas (*Pisum sativum*) were grown in eastern Kent (England) during 1933 and 1934 were surveyed in detail and classified, and are here described.

The incidence of marsh spot was correlated with the presence of a water table in the soil, a high percentage occurring only in crops grown on fields with a water table within 52 in. of the surface. In the fields surveyed in Romney Marsh this correlation was modified by the soil texture, the lowest incidence being associated with a light texture. This effect is believed to be related to differences in water movement in soils of different texture. A protracted growing period, contact of the pods with the ground, the presence of NaCl in the soil, deficiency of available potash and phosphates, and the system of cropping all proved to be totally unconnected with the occurrence of marsh spot, and

wet weather was excluded as an essential primary cause. The presence of lime in some soils producing affected crops is regarded as purely coincidental. Manuring with potash proved useless as a preventive in a very dry season (1934).

Second contribution to the knowledge on heart necrosis of potato tubers [trans. title], R. GIGANTE (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *15* (*1935*), *No. 4, pp. 555–560, fig. 1*).—The results of studies by the author, including transmission from affected to healthy tubers, led to the conclusion that heart necrosis is due to a virus.

Preliminary studies of the response of some Italian varieties of potatoes to the viruses [trans. title], R. GIGANTE (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser.*, *15* (*1935*), *No. 4, pp. 533–547, figs. 8*).—The reaction of four varieties to the X virus, the Y virus, and the two combined is reported.

A study of the mycorrhizas of healthy and mosaic potato plants [trans. title], [J.] COSTANTIN and [J.] MAGROU (*Rev. Path. Vég. et Ent. Agr. France*, *22* (*1935*), *No. 1, pp. 60–62*).—Continuing this series of studies on mycorrhizas of potatoes (E. S. R., 74, p. 654), healthy tubers of the Arran Victory and mosaic tubers of the Eigenheimer varieties of potato were planted in mid-May in field soil at 1,400 m altitude and healthy tubers of the Bevelander and mosaic tubers of the Eigenheimer varieties at 560 m altitude. Roots from all four lots were gathered and fixed in mid-August. Histological study of this material revealed in the healthy roots an abundant infestation and a well-established symbiotic equilibrium with a fungus having all the characters of an endotrophic mycorrhiza and in the mosaic roots a light infestation in restricted areas, or an almost total destruction of the fungus after it had invaded the root tissues.

Physiological specialization in Phytophthora infestans, together with a contribution on methods of breeding blight-resistant potatoes [trans. title], R. SCHICK and H. LEHMANN (*Züchter*, *8* (*1936*), *No. 2, pp. 34–46, figs. 3*).—The cultural and infection methods used in the present investigation of 4 single-spore strains of *P. infestans* are detailed. Cultures on malt extract agar, potato tubers, and potato foliage were used side by side and successively in order on the one hand to avoid the danger of intermixture and on the other to insure the optimum infectivity of the spores.

The infection tests were made on 246 potato clones derived from the F_1 and F_2 generations and successive backcrosses of *Solanum demissum* × *S. tuberosum*, and the results are discussed. By their behavior toward the 4 *Phytophthora* strains the potatoes fell into 5 clonal groups, and the behavior of the fungus strains in relation to these groups is described.

The significance of the various fungus strains in relation to breeding work is discussed, and it is concluded that the aggressiveness of a strain for the breeding material, rather than its geographical distribution, determines its importance for breeding investigations.

A test collection for the characterization of the 4 fungus strains is announced, and the possibility of the finding of further fungus races is discussed.

Yellow oxide of mercury treatment for seed potatoes on Long Island, H. S. CUNNINGHAM (*New York State Sta. Bul. 668* (*1936*), *pp. 14*).—Treated at the rate of 1 lb. to 15 gal. of water, emergence was definitely delayed. This did not affect the ultimate growth of Irish Cobbler plants but did affect that of Green Mountain plants. Seed pieces cut from treated seed blackened on the cut surface if stored, but this did not prevent proper healing of the cut surface. Even when soil borne, stem infection by *Rhizoctonia* was reduced. Under the experimental conditions treatment of uncut Irish Cobbler tubers

resulted in significant increases in yields, but similar treatment of Green Mountain tubers not only did not increase the yields significantly but sometimes resulted in lower yields. Treatment of seed pieces at the time of cutting or planting sometimes resulted in decreased yields, but when applied at least 4 weeks before planting no injurious effects were noted.

Date of digging and its relation to the development of Rhizoctonia on potato tubers, S. G. PEPPIN and R. R. HURST (*Amer. Potato Jour., 13 (1936), No. 3, pp. 74–76*).—The results of a long-time field experiment indicated that there is a considerable increase in the number of diseased tubers from week to week, and that on heavily infested soil the normal digging time is too late. Where *Rhizoctonia* is a factor, digging the potato crop at as early a date as possible—just prior to or immediately after maturity—is recommended.

The root-knot nematode (*Heterodera marioni*) in relation to the potato industry on Long Island, H. S. CUNNINGHAM (*New York State Sta. Bul. 667 (1936), pp. 24, figs. 7*).—From the study here reported, it is concluded that though this nematode is a serious pest of Long Island potatoes it is unlikely to spread much beyond its present distribution, although winter conditions are too mild to eradicate it or to reduce materially the infestation. Badly infested tubers cannot be marketed advantageously. The more common weed species found on potato soils are hosts to *H. marioni*.

Control by chemical treatments is too costly or is otherwise impracticable. Clean cultivation for two seasons as a summer fallow is recommended for elimination of this nematode.

Studies of the host plants of the potato nematode (Heterodera schachtii f. solani) [trans. title], E. REINMUTH and W. SPRINGENSGUTH (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 1, pp. 8–13, figs. 4*).—*H. schachtii f. solani* is reported infesting and forming cysts in *Solanum miniatum* and tomato (*S. lycopersicum* [=*Lycopersicum esculentum*]). The following Solanaceae, grown in infested soil, were shown to be free of nematodes: *S. sisymbrifolium* [=*S. sisymbriifolium*], *Schizanthus pinnatus*, *Salpiglossis sinuata*, *Petunia hybrida*, *Nicandra physaloides* [= *N. physalodes*], *Scopolia lurida*, *Hyoscyamus niger*, *Atropa belladonna*, *Nicotiana silvestris* [= *N. sylvestris*], *N. fragrans*, *N. tabacum*, and *N. rustica*. In the following nonsolanaceous plants, also grown on infested soil, nematodes could not with certainty be demonstrated: Summer rape, rutabaga, sugar beet, oats, and barley.

On the thermal death-point of Heterodera schachtii, M. J. TRIFFITT and R. H. HURST (*Jour. Helminthol., 13 (1935), No. 4, pp. 219–222*).—In each of the tests here reported 100 potato-strain cysts to each small, gauze-covered tube, into which heated water was pipetted, were held at the desired temperature in a controlled water bath. The temperatures ranged from 110° to 130° F., and comparisons were also made with published studies on heat treatments of *Anguillulina dipsaci* and the beet strain of *H. schachtii*.

Briefly, the results indicated that 116° for not less than 45 min. killed the entire cyst contents. Higher temperatures killed more quickly, the time ranging from 30 min. at 118° to 5 min. at 130°. Shorter exposures to these temperatures may cause a retardation in development up to several weeks.

Since the results of laboratory tests may not be fully applicable in practice, extended trials with infested tubers must be made before commercial application of the method can be recommended. From the correlative data at hand it would seem that the degree of moisture around the cysts during treatment is an important factor in determining their reactions to heat.

Experiments on the control of "potato-sickness" by the addition of certain chemicals to soil infected with Heterodera schachtii, R. H. HURST and

M. J. Triffitt (*Jour. Helminthol.*, *13* (*1935*), *No. 4*, *pp. 191–200*, *fig. 1*).—Laboratory tests indicated that sufficiently concentrated solutions of ferric chloride, ferrous sulfate, and chinosol, and vapors from potassium ethyl xanthate are lethal to the larvae of *H. schachtii*. When these chemicals were mixed separately with moist, infested soil and left for a time, the reduction in numbers of larvae which later hatched in a solution of potato-root excretion was in the following descending order: Potassium ethyl xanthate, ferric chloride, chinosol, and ferrous sulfate. Ferric oxide in a solution of root excretion containing cysts delayed the commencement of hatching. In small-scale field experiments, with the chemicals applied chiefly to the rows, the potatoes on the treated areas showed, in general, no marked symptoms of eelworm infestation, as did those on the control areas. The highest yields followed the ferric treatment.

Calcium cyanamide and other artificial fertilisers in the treatment of soil infected with Heterodera schachtii, R. H. Hurst and M. J. Triffitt (*Jour. Helminthol.*, *13* (*1935*), *No. 4*, *pp. 201–218*, *pl. 1*).—Of the substances used in this study (sulfur, naphthalene, basic slag, kainit, superphosphate, muriate and sulfate of potash, sulfate of ammonia, nitrate of soda, and calcium cyanamide), the last appeared to be the only one giving promise for field-scale application to reduce the viable eelworm content of infested soil. However, even in pot tests, where it was intimately mixed with the soil and given any desired amount of moisture, the equivalent of at least 1 ton per acre and to a depth of 9 in. was required to reduce efficiently the numbers of new cysts. The soil texture would also influence the efficiency of the treatment. Furthermore, the soil moisture at the time of application would influence the thoroughness of incorporation of the cyanamide with the soil, its degree of toxicity to the eelworms, and the time necessary between application and safe planting of potatoes. There appears to be no reason why effective application should directly precede the planting of potatoes, since laboratory tests indicated that the eggs and larvae are killed in the resting stage (cysts).

Researches on sugar beet yellowing, together with some observations on mosaic of this species [trans. title], G. Roland (*Sucr. Belge*, *55* (*1936*), *Nos. 11*, *pp. 213–217*, *figs. 2*; *12*, *pp. 231–241*, *figs. 2*; *13*, *pp. 263–268*, *figs. 3*; *14*, *pp. 289–293*).—This study deals principally with sugar beet yellowing, but with subsidiary experiments on mosaic. The yellowing disease is characterized by a yellowing of the outer leaves, accumulation of starch in the blade, and gummosis in the phloem. It was shown to be transmissible by grafting and by *Myzus persicae* and *Aphis fabae*, but not by direct transfer of the sap. The disease approaches most closely the characteristics of potato leaf roll. The appearance of the symptoms is favored by light and by dryness. The causal agent overwinters in beet roots held over for seed production and in the roots of escaped plants.

Sugar beet mosaic exhibits chlorotic symptoms of very diverse aspect, even on the leaves of the same plant, so that they are difficult to characterize. Light seems to retard appreciably the development of the symptoms. Confirmation is afforded that *M. persicae* is a vector of this mosaic.

Some observations on leafspots of tobacco caused by phosphorus deficiency, M. G. Mes (*So. African Jour. Sci.*, *32* (*1935*), *pp. 246–256*).—Tobacco grown in water cultures deficient in phosphate but with increasing iron concentrations showed decreases in length of plants and in size of leaves and root systems and increases in the number of leaves. Leaf spots (various colors) occurred at all iron concentrations used—white spots mostly on the lower, lighter green leaves and reddish-brown ones on the upper, darker green leaves. Under canvas the leaves were a lighter green and developed the white spots even with the stronger iron concentration.

In sand cultures deficient in phosphate and with alkaline reaction the leaf spots were mostly white, and the leaves were lighter green. With acid reaction, the leaves were dark green and the spots mostly reddish brown. The white leaf spots in sand cultures occurred only under canvas, and they were more numerous with an alkaline reaction.

In soil cultures in strong light, leaf spots of various colors were distributed as in the water and sand cultures. Under canvas the leaves were lighter green, and only white spots developed.

Plants grown under shelter were always taller and the leaves much larger, thinner, softer, and lighter green than under stronger light. It is concluded that the color of the leaf spots of tobacco plants under phosphorus deficiency is associated with the color of the leaves.

Boron deficiency symptoms occurred on plants in one of the soils used, and were cured by the addition of boron.

Temperature studies of some tomato pathogens, A. A. NIGHTINGALE and G. B. RAMSEY (*U. S. Dept. Agr., Tech. Bul. 520 (1936), pp. 36, figs. 9*).—In an attempt to determine the influences of temperature and maturity of fruits on the development of decay after tomatoes leave the packing house, growth-rate studies were made with nine organisms commonly producing decay of tomatoes during transit and storage, viz, *Melanconium* sp., *Rhizoctonia solani*, *Fusarium semitectum*, *Colletotrichum phomoides*, *Phoma destructiva*, *Cladosporium fulvum*, *Alternaria solani*, *A. tomato*, and *Pleospora lycopersici* (and its conidial stage *Macrosporium sarcinaeforme*). Their rates of development were studied on both green and ripe tomatoes inoculated with pure cultures and held at temperatures ranging from 32° to 85° F. at 5° intervals. The cardinal temperatures for each of the fungi were determined by comparing the average daily increase in diameter of colonies grown for 1 week on Petri dishes containing potato dextrose agar at pH 4.7 and 6.01, respectively. *F. semitectum*, *Phoma destructiva*, *A. solani*, and *Pleospora lycopersici* all grew much better on the agar at pH 6.01, which agrees with the fact that lesions induced by these fungi grew much faster on ripe than on green fruits. This would indicate that change in acidity during ripening is important in determining the ability of the fungus to produce decay on ripe fruits. The temperature relations of the nine fungi are discussed in detail.

In the case of several of the fungi, as the green fruits ripened the rate of spread within the tissues increased, but after the lesions had attained considerable size the growth rate began to decrease, so that the average daily increase followed a curve having its high point at about the time the fruit was just turning red. Therefore, in any one experiment the difference between the diameters of lesions on fruits inoculated while green and the ones on parallel fruits inoculated after ripening decreased as the green fruits ripened.

Pathological studies on watermelon wilt, I–VII, H. YOSHII (*Bul. Sci. Fakult. Terkult., Kjûŝu Imp. Univ., Fukuoka, Japan, 5 (1933), Nos. 3, pp. 313–326, figs. 12, Eng. abs., pp. 325, 326; 5, pp. 578–589, figs. 5, Eng. abs., pp. 588, 589; 6 (1934), No. 1, pp. 1–15, figs. 8, Eng. abs., pp. 14, 15; 16–33, figs. 9, Eng. abs., pp. 32, 33; 6 (1935), No. 4, pp. 312–330, fig. 1, Eng. abs., pp. 329, 330; 331–347, figs. 3, Eng. abs., pp. 345–347; 348–360, Eng. abs., pp. 359, 360*).—The following papers are included:

I. *On the mode of infection of the causal fungus, Fusarium niveum, EFS.*—Typically the fungus invades the root cap first, then the primordial meristem, or it may directly attack the latter, after which it reaches the stele, penetrating the meristematic tissue intercellularly or intracellularly. Then the fungus progresses vigorously along the xylem elements, destroying the tissues and

finally resulting in the wilted condition. Infection is said to be successful only when meristematic tissue is invaded.

II. *On the migration of microconidia.*—From cultural studies it is believed that mycelial growth cannot account for the presence of the pathogen far from the focuses of infection, but that this is due to the formation and migration of microconidia in the tracheal elements.

III. *Pathological anatomy of the diseased seedling.*—The soft rot condition of the seedling was found to be the result of the actual invasion of the fungus from the vessels into the parenchymatous tissues.

IV. *The pathological anatomy of the affected plants.*—This part reports on detailed studies of the morbid anatomy of mature plants, with special reference to the rootlets, main roots, and stems. Although true at the beginning of infection, in mature plants no suberization occurred around the diseased tissues and the mycelia intruded rather easily into the surrounding cells. These differences are believed to be due mainly to the toxic effects of a substance or substances excreted from vigorously growing mycelia into the tissues.

V. *On the metabolism of Fusarium niveum, with special reference to its gas evolution.*—When the fungus was grown in media with various sugars as the source of carbon, it was found that the amount of gas evolved depended on the sugar content and on the condition of the culture as to aeration. No growth occurred under strictly anaerobic conditions. When *F. niveum* was cultured in media containing from 2 to 5 percent of glucose, the latter was fermented with abundant gas evolution, but data are presented as showing the sugar content of the ascending sap of watermelons to be too low for gas production.

VI. *On the toxic effect of the staled culture solution of Fusarium niveum upon plants.*—Cut stems of watermelon, and whole seedlings of soybean, cotton, watermelon, tomato, and *Mimosa pudica*, placed in Berkefeld filtrates of Czapek medium in which *F. niveum* had grown for 2 mo., were definitely injured and in many cases killed, but the symptoms were not those of wilt. The poison is said to contain two substances, one enzymic and the other dialyzable and nonvolatile in nature. From the data presented here and in the literature, it is believed that the theory of toxic action is insufficient to explain fully the cause of wilting.

VII. *General discussion on the hypothesis of the local destruction of water conductive tissue.*—The three general theories in explanation of the wilting induced by this vascular pathogen (viz, embolism of conductive tissue, toxic action, and destruction of tissues) are reviewed and compared, and the author gives the bases of his hypothesis that the cause lies in the local destruction of the water-conducting tissue by actual fungus invasion. The role played by the poisons is presumed to lay in the prevention of the walling-off of affected parts. In addition, rootlet and leaf parenchyma destruction are believed to explain some cases of wilting. These cases also coincide in attributing the wilt condition to actual fungus invasion.

Bitter rot of apple, A. B. Groves (*Va. Fruit, 24 (1936), No. 5, pp. 12, 14, 16, fig. 1*).—This contribution by the Virginia Experiment Station briefly summarizes data on the rot due to *Glomerella cingulata*, including lists of the most common Virginia varieties classified as susceptible or resistant.

Studies of the causes of resistance and susceptibility of apple varieties to mildew [trans. title], Z. Csorba (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 5, pp. 280–296, figs. 13*).—The germ tube of *Podosphaera leucotricha* penetrates directly through the epidermal cell walls. Measurements of the thickness of the outer walls of epidermal cells of several apple varieties indicated that varieties strongly resistant to mildew have distinctly and sig-

nificantly thicker walls than very susceptible varieties. However, within the respective groups of resistant and susceptible varieties there are variations in resistance to mildew that cannot be correlated with corresponding variation in epidermal thickness, indicating that other factors, probably chemical, influence susceptibility to mildew. Different environmental conditions significantly affected the thickness of epidermal outer cell walls.—(*Courtesy Biol. Abs.*)

Observations on the susceptibility of pear varieties to Mycosphaerella sentina [trans. title], H. WENZL (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 6–7, pp. 305–316*).—The author's observations that leaf spot is much more severe on nursery than on orchard trees led to a study of the disease (1934) on 89 pear varieties in 6 Austrian districts. One-year-old trees had the least disease, older nursery trees showing increasing amounts because of the accumulating inoculum on fallen leaves. New plantings adjacent to contaminated areas showed the infection extending at the rate of only a few meters a year. The same variety growing in different parts of the same nursery or in different nurseries developed widely different amounts of leaf spot, indicating the strong influence of environment. Throughout the work it appeared that environment was generally more important than varietal constitution in determining infection. No variety appeared immune. Definite resistance was shown by Bergamotte Renée, Conférence, Eva Baltet, Fertility, Grumbkower Butter, Herzogin v. Angoulême, Liegels Winter-Butter, Vereinsdechants, and President Drouard, but all other varieties discussed appeared either moderately or strongly susceptible. There was no opportunity to compare varietal susceptibility toward both leaf spot and scab, the latter being almost entirely absent. However, detailed comparisons of the susceptibility of varieties to leaf spot with published reports of their susceptibility to scab indicated that most varieties are susceptible to both, thus refuting the commonly held opinion that it is characteristic of pear varieties to show opposite reactions toward these two diseases.—(*Courtesy Biol. Abs.*)

The virus diseases of stone fruits [trans. title], G. and M. ARNAUD (*Compt. Rend. Acad. Sci. [Paris], 202 (1936), No. 10, pp. 869–871*).—The authors discuss observations on the symptoms and course of mosaic disease of stone fruits in seven species of ***Prunus*** in which graft inoculations were made with facility, but no apparent symptoms were obtained by such inoculations on ***P. mahaleb***, ***P. padus***, pomaceous fruits, or on various nonrosaceous plants. Thus far mosaic of stone fruits is little known in France. Although readily transmitted by grafting, plants thus inoculated in August did not show infection until the following spring.

Experiments on treatments for control of chlorosis of peach trees, [I], II [trans. title], P. H. JOESSEL and A. LIDOYNE (*Compt. Rend. Acad. Agr. France, 22 (1936), Nos. 7, pp. 306–311; 8, pp. 315–320*).—The following two papers are included:

I. *Tests with the Mokrzecki procedure during the 1933–34 and 1934–35 seasons.*—This is a progress report on tests with iron salts (particularly iron sulfate) applied in various ways to the soil or the trees for control of peach chlorosis. Encouraging results were obtained.

II. *Tests with the procedures of Rassiguier and of Gris during the 1934–35 season.*—In continuation of these tests with various iron salts and methods of application, it was found that a slight greening of the leaves followed application of iron sulfate solution. Results were better with the pyrophosphate and the ammoniacal citrate of iron, but the salt giving the best and most distinct results was the double salt ammonium-iron sulfate. For spraying the foliage the last-named is to be preferred.

The gum disease of citrus occurring in the Philippines, G. O. OCFEMIA, I. C. MANZO, and M. S. CELINO (*Philippine Agr., 24 (1936), No. 10, pp. 811–838, figs. 8*).—In this report of an investigation of the Philippine gum disease of citrus, discussions are given of the distribution, importance, nature, and symptoms of the disease; descriptions of the early and advanced stages of infection and of the fungus shown to be the cause (including the isolation, life history, taxonomy, morphology, cultural characters, pathogenicity, dissemination, and mode of infection); and suggestions for control, including the use of resistant stock.

In a few cases a Diplodia (tentatively referred to *D. natalensis*) and in one case *Hyphomyces haematococcus* were isolated, and both were shown by inoculations to be capable of producing a type of gum disease. On the other hand, *Fusarium solani* was present in practically all the specimens studied, and is shown to be the cause of the gum disease in question.

Injuries due to bacteriosis in the seeds of Hibiscus cannabinus [trans. title], L. S. GITMAN and E. A. BOICHENKO (BOJCZENKO) (*Bot. Zhur. S. S. S. R. (Jour. Bot. U. R. S. S.), 20 (1935), No. 5, pp. 487–493, figs. 4; Ger. abs., p. 493*).—Seeds infected by *Pseudomonas hibisci* [=*Phytomonas hibisci*] became disinfected by a 5-min. treatment with a 0.1 percent solution of $HgCl_2$. Artificially infected seeds had their germinability decreased by about 23 to 28 percent, and plants developing from the seeds which germinated died before reaching the height of 15 cm. Seeds held in the laboratory for from 1 to 4 yr. developed the bacteriosis on germination.

Fusarium crown and root rot, and Sclerophoma stem blight, of the Texas bluebell, J. J. TAUBENHAUS and W. N. EZEKIEL (*Bul. Torrey Bot. Club, 62 (1935), No. 9, pp. 503–510, figs. 2; abs. in Texas Sta. Circ. 78 (1936), pp. 21, 22*).—Attempts by florists to grow the Texas bluebell (*Eustoma russellianum*) have been disappointing because of diseases. This contribution by the Texas Experiment Station deals with two of the latter—a crown and root rot of seedlings and older plants shown to be due to *F. solani*, and a more destructive stem blight caused by *S. eustomonis* n. sp. Mealybugs (*Pseudococcus maritimus*) were proved capable of spreading the latter, which is also carried by fragments of infected pods mixed with the seeds. Sterilizing the screened seeds lowered the infection, a combined spray of bordeaux mixture, nicotine sulfate, and casein gave fair control, and a strain of the host has shown high resistance.

Reaction of chestnut bark to invasion by Endothia parasitica, W. C. BRAMBLE (*Amer. Jour. Bot., 23 (1936), No. 2, pp. 89–94, figs. 6*).—"Primary invasion of chestnut bark by *E. parasitica* is accomplished through a mass action of fanlike mats of mycelium; secondary invasion of bark tissue takes place in cells at the sides of mycelium-fans by means of penetration by individual hyphae. A chemical change of the nature of a partial lignification occurs in the walls of cells in the path of mycelial-fans and in the walls of cells adjacent to the sides of mycelial-fans. Such chemical alteration does not appear to be effective in impeding the advance of the fungus.

"Wound periderm has been observed in the bark of vigorous chestnut stems located between *E. parasitica* infections and uninfected bark. Periderm, thus occurring in reaction to infection, resembles normal secondary periderm of chestnut bark in its general mode of formation and form, but differs specifically in time of formation, proportion of thin-walled to thick-walled cork cells produced in the phellem, and in the number of layers of cells composing the phelloderm. Wound periderm found in hypertrophied cankers separated infected tissue from the underlying bark, and it seems probable that its formation is a

significant reaction for consideration in connection with resistance to chestnut blight."

Susceptibility of different species and varieties of elms to Ceratostomella ulmi [trans. title], C. BUISMAN (*Rev. Path. Vég. et Ent. Agr. France, 22 (1935), No. 3, pp. 200–208*).—The results of inoculation tests on various European and Asiatic species and varieties of *Ulmus* are given.

Brief report of experimental work on the Dutch elm disease performed at the Phytopathological Laboratory "Willie Commelin Scholten" at Baarn during 1935 [trans. title], J. WESTERDIJK (*Tijdschr. Plantenziekten, 42 (1936), No. 2, pp. 17–20*).—This is a review of studies at this institution.

The resistant elm No. 24 [trans. title], C. BUISMAN (*Tijdschr. Nederland. Heidemaatsch., 48 (1936), No. 2, pp. 73–76*).—This is a note on a seedling ("No. 24") of *Ulmus foliacea* which has shown great resistance to the Dutch elm disease (*Graphium ulmi*).

ECONOMIC ZOOLOGY—ENTOMOLOGY

Abundance and digging rate of pocket gophers (Geomys bursarius), C. O. and W. P. MOHR (*Ecology, 17 (1936), No. 2, pp. 325–327*).—By trapping of given areas and by comparison of digging rates it is estimated that "pocket gophers averaged between 4 and 5.5 individuals to the acre on natural prairie during early October. This is soon after the breeding season and therefore before populations drop to their annual low. The rate under alfalfa was as high as 6 to the acre. Much of the ground between colonies is temporarily unsatisfactory because of denudation, etc., but must be considered in making calculations of economic density. The function of such resting ground is in part to permit new growth of food, reconsolidation of soil, and possibly disinfection and reduction of excreta."

The food and breeding habits of the raccoon, W. J. HAMILTON, JR. (*Ohio Jour. Sci., 36 (1936), No. 3, pp. 131–140, pl. 1, fig. 1*).—This paper, prepared with a view to furnishing information on the life history of the raccoon (*Procyon lotor lotor*), deals with the nature of its food, reproduction, importance as a fur bearer and game animal, and future status. The author's observations have shown that apples, buckwheat, various berries, corn, and acorns might profitably be added to the feed of captive ranch-raised animals.

The ability of rats to discriminate between diets of varying degrees of toxicity, K. W. FRANKE and V. R. POTTER (*Science, 83 (1936), No. 2153, pp. 330–332, fig. 1*).—Work at the South Dakota Experiment Station has demonstrated that rats are able to detect and differentiate between small quantities of selenium in foodstuffs. Sublethal injections of sodium selenite caused a voluntary starvation even when normal diets were offered. It is pointed out that the question whether or not systemic effects may be the entire factor controlling this differentiation should not be ignored, although this selection of foods may be due to the taste of the diets or even the odor.

[Bird families of the United States and Canada] (*Natl. Geogr. Mag., 69 (1936), No. 1, pp. 95–122, pls. 8, figs. 12; 4, pp. 522–546, pls. 8, figs. 6; 6, pp. 801–828, pls. 8, figs. 9*).—Continuing this series (E. S. R., 73, p. 338), illustrated by paintings by A. Brooks, the twelfth article is entitled Birds of the Northern Seas, by A. Wetmore, the thirteenth Thrushes, Thrashers, and Swallows: Robins and Bluebirds Are Familiar Members of a Famous Musical Family Which Includes the Hermit, Thrush, and European Nightingale, by T. G. Pearson, and the fourteenth Parrots, Kingfishers, and Flycatchers: Strange Trogons and Curious Cuckoos Are Pictured With These Other Birds of Color, Dash, and Courage, by A. Wetmore.

A note on Dictyocaulus from domestic and wild ruminants, G. DIKMANS (*Jour. Wash. Acad. Sci., 26 (1936), No. 7, pp. 298–303, fig. 1*).—The author is unable to find definite morphological characters to separate the females of *D. hadweni* Chapin 1925 and *D. viviparus* (Bloch 1782) Raill. & Henry 1907, and it is concluded that *D. hadweni* must fall into synonymy. It is pointed out that only carefully controlled feeding experiments could establish whether there are biological varieties capable of infecting only cattle or only deer, or whether these nematodes are biologically as well as morphologically identical.

Physaloptera felidis n. sp., a nematode of the cat, J. E. ACKERT (*Amer. Micros. Soc. Trans., 55 (1936), No. 2, pp. 250–254, figs. 6*).—Twenty-three nematodes taken from the domestic cat by the Kansas Experiment Station are described as new under the name *P. felidis*, this apparently being the first record of *Physaloptera* from this host in North America. "The specific differences in structure between *P. felidis* and other species of *Physaloptera* reported from cats include (1) the forward position of the vulva, which is anterior to the base of the esophagus, (2) the absence of a posterior prepucelike fold in either sex, (3) the lengths and widths of the spicules, and (4) the number and arrangement of the bursal papillae."

[Notes on economic insects and their control] (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 804–807*).—The notes here contributed (E. S. R., 75, p. 655) are as follows: Toxicity of Certain Azo Compounds to Mosquito Larvae, by D. E. Fink and D. L. Vivian (p. 804); Toxicity of Certain Organic Compounds to Culicine Mosquito Larvae, by D. E. Fink and L. E. Smith (pp. 804, 805); Beet Leafhopper on Texas Spinach, by S. E. Jones (pp. 805, 806), contributed from the Texas Experiment Station: Effect of Low Temperature in Shortening Hibernation Period of Insects in the Egg Stage, by F. Flemion and A. Hartzell (p. 806); Further Observations on the Oblong Leaf Weevil [*Phyllobius oblongus* L.] in Western New York, by L. A. Carruth (pp. 806, 807), contributed from the New York State Experiment Station; *Bruchus brachialis* Fahraeus in Georgia, by L. J. Bottimer (p. 807); and *Spathius canadensis* Ashm., a Parasite of *Hylurgopinus rufipes* (Eich.), by B. J. Kaston and W. B. Becker (p. 807), contributed from the Connecticut [New Haven] and Massachusetts Experiment Stations.

[Contributions on extension entomology] (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 760–765*).—The contributions relating to extension entomology here presented include the following: Fighting Chinch Bugs in Iowa, by A. D. Worthington and G. C. Decker (pp. 760–764), and Obtaining Cooperation of Growers in Studying Spray Schedules, by G. D. Jones (pp. 764, 765), contributed from the Missouri Experiment Station.

[Contributions on plant quarantine and inspection] (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 766–790, figs. 3*).—These contributions include the following: Recent Developments in Canadian Regulatory Work, by L. S. McLaine (pp. 766–771); Cooperation of Officials of the Kansas Port of Entry in Assisting the Kansas Entomological Commission to Enforce Regulatory Measures, by G. A. Dean (pp. 772, 773); Recent Work in Control of Gypsy Moth and Brown-Tail Moth, by A. F. Burgess (pp. 773–778); Japanese Beetle in the Middle West, by J. C. Dawson (pp. 778–780); The Chinch Bug Situation in Iowa, by C. J. Drake and G. C. Decker (pp. 781–785); and Progress in Dutch Elm Disease Eradication, by L. H. Worthley (pp. 785–790).

[Contributions on economic entomology] (*Conn. Pomol. Soc. Proc., 45 (1935), pp. 159–165, 175, 176, 180, 181, 225–247*).—Contributions here presented are as follows: Research to Find Substitutes for Lead Arsenate, by R. C. Roark (pp. 159–165); Report of Peach Moth [Oriental Fruit Moth] Parasite Produc-

tion and Distribution Committee: Financial Statement, Year 1935, by H. C. C. Miles (pp. 175, 176): Report of Committee on Injurious Insects, by W. E. Britton et al. (pp. 180, 181); Codling Moth, Plum Curculio, and Apple Maggot, by A. I. Bourne (pp. 225–237), contributed from the Massachusetts Experiment Station; and [European] Red Mite, [White Apple] Leaf Hopper, and [Fruit Tree] Leaf Roller, by P. Garman (pp. 237–247), contributed from the Connecticut [New Haven] Experiment Station.

[Work in entomology by the Arizona Station] (*Arizona Sta. Rpt. 1935, pp. 52–55*).—The work of the year (E. S. R., 73, p. 504) referred to relates to scale insects of the State, biology of the range grasshopper, and a dipteran (*Itonida citrulli* Felt) which appeared in the Santa Cruz Valley as a new enemy of watermelon vines, in the growing tips of which the larvae develop causing them to become deformed and die.

A general summary of insect conditions in Florida, J. R. Watson (*Citrus Indus., 17 (1936), No. 3, p. 6*).—A general summary of information contributed from the Florida Experiment Station.

[Work with economic insects by the Kentucky Station] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 25–27, 50–54*).—Work conducted during the year (E. S. R., 73, p. 808) includes control of insects injurious to tobacco plants in the beds, control of wireworm injury to tobacco plants, tobacco extract as a spreader or emulsifier in sprays, new spray mixtures, soybean flour and other activators for nicotine sulfate, nicotine thiocyanate as an insecticide, new carriers and diluents for nicotine, white grubs and their injury to farm crops, the sod webworm, and corn earworm control.

[Report of work in entomology by the Tennessee Station], S. Marcovitch (*Tennessee Sta. Rpt. 1935, pp. 33, 34*).—Reference is made to the progress of work (E. S. R., 75, p. 806) with cryolite and other fluorine compounds, observations of the nocturnal habits of cutworm moths, determination of the possible effect of the trapping of the corn earworm, Mexican bean beetle control, and the occurrence of several of the more important insect pests of 1935, including the eastern tent caterpillar, tarnished plant bug, cotton leaf worm, lesser cornstalk borer, and the potato tuber worm.

A device for the rapid counting of large numbers of small insects, P. S. Milne (*Bul. Ent. Res., 27 (1936), No. 2, pp. 269–271, pl. 1, fig. 1*).—This contribution from the Rothamsted Experimental Station describes a device designed to facilitate the handling of the insects and to increase the speed and accuracy of the counting. The apparatus consists essentially of a turntable with a circular trough which takes the place of the stage of a low-powered binocular microscope with a wide field. On the right of the microscope is a funnel which guides the insects on to the trough as the turntable is rotated. On the left of the microscope is a nozzle through which the insects are lifted by suction into a pill box after being counted.

Observations on sunflower insects in Kansas, F. H. Walker, Jr. (*Jour. Kans. Ent. Soc., 9 (1936), No. 1, pp. 16–25*).—This annotated list of insects found by the author on both wild and cultivated sunflowers in Kansas includes observations on those causing the greatest damage.

It is pointed out that the sunflower has many insect pests which cause considerable damage and are present each year in varying numbers and others which make this plant the secondary or alternate host. The former include *Aphis helianthi* Monell and *Charidryas mycteis* Doubl. and Hewitt on the foliage, *Rhynchites aeneus* Boh., *Mordellistena pustulata* Melsh., and *Rhodobaenus 13-punctatus* Ill. in the stem, the sunflower maggot on the roots, and *Tephri-*

tis finalis Lw., *Homoeosoma electum* Hulst, and *Suleima helianthana* Riley in the seeds.

A three-page list is given of references to the literature.

Pests attacking citrus in Jamaica, W. H. Edwards (*Bul. Ent. Res., 27 (1936), No. 2, pp. 335–337*).—A list is given with notes on insects attacking citrus in Jamaica.

Survey of insect fauna of some Michigan trout streams in connection with improved and unimproved streams, W. F. Morofsky (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 749–754*).—Data obtained by the Michigan Experiment Station indicate an increase in the insect fauna of improved over unimproved streams, confirming the results obtained the preceding year (E. S. R., 73, p. 69). In most cases there was a decrease in other animal life.

A new form of cryolite, S. Marcovitch and W. W. Stanley (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 725–728*).—A new form of sodium fluoaluminate has been found by the Tennessee Experiment Station to represent a vast improvement over present fluorine insecticides in physical properties. "The new insecticide is bulky, occupies 85 to 100 cu. in. to the pound, and possesses excellent suspension properties. Sprays and dusts on apple, peach, potato, beans, cucumber, tobacco, and smartweed showed no foliage injury whatever. Tests against the sweetpotato flea beetle showed excellent results as compared with Dutox and calcium arsenate. Field experiments against the Mexican bean beetle showed control practically as good as Cubor and better than Dutox, magnesium arsenate, and cryolite. A soapstone-HF compound appears promising as a new fluorine insecticide."

References to the use of ethylene oxide for pest control, H. D. Young and R. L. Busbey (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, pp. 16*).—A list is given of titles of published works on the use of ethylene oxide, a considerable body of data on which as an insecticide and weed killer has been accumulated.

Toxicity of kerosene steepates of derris and pyrethrum to some potato insects, T. C. Allen (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 742, 743*).—In experimental determinations by the Wisconsin Experiment Station of the relative toxicity of derris and pyrethrum steepates to leafhoppers (potato leafhopper) and flea beetles (potato flea beetle), pyrethrum was found to be quite specific in its toxicity as a contact insecticide to leafhoppers while derris is specific to flea beetles.

Toxicity of rotenone and pyrethrins, alone and in combination, R. H. LePelley and W. N. Sullivan (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 791–797, figs. 3*).—In the work reported, "alcoholic solutions of pyrethrins and of rotenone and mixtures of these solutions were tested against houseflies by a turntable method. Rotenone was from 5 to 6 times as effective as pyrethrins containing pyrethrin I and II in equal proportions, when mortality counts were made at the end of 3 days after treatment. No striking synergistic effect was produced by 50:50 mixtures of these solutions, but they appeared to be significantly more effective than expected. It was doubtful whether the 25 (rotenone):75 (pyrethrins) mixtures were more effective than expected.

"As the results showed that mixtures of rotenone and pyrethrins are compatible, attention was given to sources of rotenonelike insecticides for mixing with pyrethrum extracts for the control of coffee insects in Kenya. A few tests were made of acetone extracts of the leaves, roots, and stems of a sample of *Cracca vogelii* received from Kenya. The effectiveness of these parts decreased in the order named. The extract of the leaves, which contain the largest proportion

of toxic materials, exerted an effect equivalent to a rotenone content in the plant material of about 2 percent."

Studies of certain new wetting agents and their application with insecticides and fungicides, R. E. Heal, J. B. Schmitt, and J. M. Ginsburg (*Jour. Econ. Ent.*, *29* (*1936*), *No. 4*, *pp. 714–722*).—The results of studies at the New Jersey Experiment Stations with three closely related neutral wetting agents which proved compatible with hard water as well as with various contact insecticides, stomach poisons, and fungicides, namely, Aresket, Areskap, and Aresklene, sodium salts of sulfonated diphenyl compounds, are reported upon.

Plants have been found tolerant to all three products in dilutions of 1:400 or higher. It is concluded that "Aresket can be used effectively in making elemental sulfur wettable, either when mixed dry with the sulfur or when in water solution to which the sulfur is added. Aresklene at the rate of 0.5 percent will make stable petroleum-oil emulsions containing 66 to 70 percent actual oil. Areskap will render many oils and solvents in which it is soluble miscible with water. Aresket at 2 oz. to 100 gal. can be used satisfactorily as a spreader in a tank-mixed bentonite-nicotine spray for codling moth control. Aresklene and Areskap at 0.5 percent are suitable emulsifying agents for summer oils for use in lead arsenate-oil combinations for codling moth control. Aresket at 1 oz. to 100 gal. will render flowers of sulfur wettable for use in orchard spraying. A procedure is indicated by which the sulfur is added to the tank before the spray is diluted to its final concentration. This concentration also gives efficient spreading for a sulfur-lime-lead arsenate combination, but the presence of colloidal clay is required to give adhesion. The use of sulfur-colloidal clay-Aresket combination shows a reduction in cost over a commercial bentonite-sulfur spreader combination. Aresket and Areskap at 10 oz. to 100 gal. are effective wetting agents with derris for European red mite control, and with derris or nicotine for apple aphid control. Their use is indicated in spray combinations not compatible with soap."

Miscible oil emulsifiers and spreaders, C. O. Eddy (*Jour. Econ. Ent.*, *29* (*1936*), *No. 4*, *pp. 722–725*).—A general account is given of the progress of work with miscible oil emulsifiers and spreaders at the Kentucky Experiment Station (E. S. R., 72, p. 219; 73, p. 345).

Rôle of light traps in control of mushroom springtail, C. C. Compton (*Jour. Econ. Ent.*, *29* (*1936*), *No. 4*, *pp. 735–738*, *fig. 1*).—It was found that while light traps will not give 100 percent control, once the mushroom beds are infested they will reduce the springtail (*Achorutes armatus* Nic.) population to a point where it is not of economic importance. Excellent results were obtained in commercial houses where the traps were used before the casing soil was applied.

The probable distribution of termites through greenhouse plants, G. MacM. Kutchka (*Bul. Brooklyn Ent. Soc.*, *31* (*1936*), *No. 2*, *pp. 45–48*).—The distribution of *Reticulitermes flavipes* (Kollar) with greenhouse plants is considered, particular reference being made to observations of its conveyance in soil about the roots of *Poinsettia*.

A fungus infesting onion thrips, A. I. Bourne and F. R. Shaw (*Bul. Brooklyn Ent. Soc.*, *31* (*1936*), *No. 1*, *pp. 15–17*, *figs. 4*).—In this contribution from the Massachusetts Experiment Station reference is made to a fungus, tentatively identified as *Empusa sphaerosperma*, which caused an epidemic in onion thrips in the Connecticut Valley in Massachusetts in 1932. It reappeared in equal intensity in 1934, many plants having as many as 15 to 20 dead thrips. Observations in 1935 failed to show any appreciable amount of the fungus present.

Grasshopper injury to the inflorescence of pasture grasses, D. A. Wilbur (*Jour. Kans. Ent. Soc., 9 (1936), No. 1, pp. 1–12, figs. 5*).—An account is given of a peculiar and widespread insect injury to the inflorescence of a large series of grasses observed in the vicinity of the Kansas Experiment Station during the summer of 1932.

The study has shown that under proper conditions of temperature and moisture relatively few grasshoppers may cause great damage to grain crops by clipping the heads or eating the developing kernels. Similarly, a few grasshoppers can destroy the pasture grass seed crop. A description is given of the injury to some 10 species of grasses, followed by an account of the grasshoppers responsible for the injury, of which 15 are listed. The evidence available has led to the conclusion that the attack of the grasshoppers upon the inflorescence of grasses is an adaptation for satisfying the moisture requirements during exceptionally dry periods. A list of 12 references to the literature is included.

Food plants of some Arizona grasshoppers, E. D. Ball (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 679–684*).—The author's studies in Colorado and Arizona are said to indicate that only five or six of the true grasshoppers occurring in each State should be classed as injurious to crops and scarcely more than a dozen others listed as of serious injury to the grasses of the range. A study of their food relation has led the author to conclude that many of the species are strikingly beneficial in that they help to check the weeds that would otherwise overrun the overgrazed ranges. The very worst weeds of the western ranges have their grasshopper enemies.

Malpighamoeba locustae n. sp. (Amoebidae), a protozoan parasitic in the Malpighian tubes of grasshoppers, R. L. King and A. B. Taylor (*Amer. Micros. Soc. Trans., 55 (1936), No. 1, pp. 6–10, figs. 8*).—A protozoan, numerous cysts and trophozoites of which were first found in the Malpighian tubes in slides made from laboratory-raised grasshoppers of the genus *Melanoplus*, including the differential grasshopper, *M. mexicanus*, and the red-legged grasshopper, is described as new under the name *Malpighamoeba locustae*.

Light infestations of adult grasshoppers by this parasite are not noticeable, but as the parasites become more numerous several easily recognizable symptoms appear. "Enormous numbers of cysts are found in the feces; the animals become increasingly sluggish and consume much less food than usual. This slowing down of the normal activities is probably due to an accumulation of toxic substances which cannot be excreted by the highly congested Malpighian tubes. Heavily infested individuals finally enter a comatose condition, in which they exhibit a marked inability to remain in an upright position. As death approaches, the muscles of the jumping legs undergo tetanic twitches; the last noticeable movements seem to be those of the mouth parts. If an individual is opened and examined microscopically while in this state of stupor, one is immediately impressed by the great amount of cellular deterioration which has taken place in the Malpighian tubes and in the adjacent intestine. Other structures appear to be quite normal histologically."

Infested nymphs are said to show the same symptoms characteristic of adults. "If the intensity of the infestation increases rapidly, as it does when many animals are kept in a single cage, a large proportion of the nymphs succumb before the adult stage is reached. However, death does not usually occur before the fifth instar."

Thrips investigation: Some common Thysanoptera in Australia, H. Vevers Steele (*Austral. Council Sci. and Indus. Res. Pam. 54 (1935), pp. 59, figs. 32*).—A brief introduction, list, and key for 15 species representing 11 genera first presented are followed by accounts of these species, which include

technical descriptions of both males and females and notes on their biology and immature stages. Among the species considered is *Taeniothrips* (*Physothrips*) *simplex* (pp. 33–36), described by G. Morison[4] in 1930 as new under the name *P. simplex*. It is shown that *P. simplex*, which was described from specimens found on carnation flowers at Urrbrae, South Australia, in 1928 and since found on gladiolus in districts around Melbourne, Victoria, and Adelaide, South Australia, and *T. gladioli*, described in 1931 by Moulton and Steinweden (E. S. R., 67, p. 709) from material taken on gladiolus in Ontario, Canada, and Ohio, are the same, this decision being subscribed to by both Morison and Moulton. Holding by priority of description, according to the rules of nomenclature, the gladiolus thrips should be known as *T. simplex*.

Other economic species considered are *Haplothrips victoriensis* Bagn. (pp. 11–14), known as the black flower thrips, which occasionally damages the peach by feeding on the ripe fruit and causing white patches on the skin; the greenhouse thrips (pp. 16, 17); *Scirtothrips signipennis* Bagn. (pp. 17–20), known as the banana rust thrips, which is a serious enemy of the banana crop; *Hemianaphothrips* (*Anaphothrips*) *concinnus* Morison (pp. 22–24), locally known as the tobacco thrips due to damage of tobacco in the Pomonal district in 1934; *Frankliniella* sp. (*insularis* Morison (nec Franklin)) (pp. 25–27), known as the black carnation thrips, one of the main insect vectors of spotted wilt of tomatoes in South Australia, also collected from Western Australia, Victoria, and New South Wales; *Thrips imaginis* Bagn. (pp. 42–46), known as the apple thrips, the most important economic thrips in Australia, where it causes large biennial fluctuations in the apple crop; and the onion thrips (pp. 46–49).

A list of 48 references to the literature is included.

Laboratory studies on toxicity of nicotine and soap to gladiolus thrips and onion thrips (Taeniothrips simplex (Morison), Thrips tabaci Lindeman), H. D. TATE and F. ANDRE (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 738–741, figs. 2*).—In experimental work at the Iowa Experiment Station, the onion thrips and the gladiolus thrips *T. simplex* (see above) were used in determining the toxic effects of both nicotine and soap (sodium oleate) when used as sprays under laboratory conditions.

"The gladiolus thrips proved to be far more resistant to the sprays in every instance. A 1.5-percent solution of nicotine mixed with soap was slightly less toxic to the onion thrips than was a 7-percent concentration of the same material to the gladiolus thrips. A 50-percent mortality of the gladiolus thrips resulted when a 3-percent concentration of nicotine plus soap was used, and the same kill was obtained with a 0.30-percent concentration of the same spray in the case of the onion thrips. An 0.8-percent concentration of sodium oleate killed 50 percent of the population of *T. tabaci*, whereas it required a 2.8-percent concentration of this compound to produce the same mortality in the case of *T. simplex*.

"From the data obtained it is quite evident that wide differences in susceptibility to contact insecticides exist between these two species, and recommendations for control of different species belonging to this order should be made with regard to the specific species at hand."

The food-cycle of Dysdercus fasciatus in Acacia savannah in Northern Rhodesia, A. G. BEBBINGTON and W. ALLAN (*Bul. Ent. Res., 27 (1936), No. 2, pp. 237–249, figs. 10*).—A study of the variations of the population of *D. fasciatus* Sign. on cotton and on its wild host plants, of which the most important in the *Acacia* savanna in Northern Rhodesia is *Thespesia rogersii*, is reported upon.

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[4] Bul. Ent. Res., 21 (1930), No. 1, pp. 9–14, fig. 1.

Study of chinch bug populations in Ohio, F. B. WHITTINGTON and L. L. HUBER (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 684–686*).—The results of chinch bug population studies made by the Ohio Experiment Station (E. S. R., 74, p. 229) in several of the principal wheat-growing counties of the State in April, May, and December of 1935 are reported upon, the details being given in tables.

Third generation and method of migration of chinch bug in southwestern Oklahoma, R. O. SNELLING (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 797–803, fig. 1*).—A description is given of three full generations of the chinch bug observed under field conditions in southwestern Oklahoma during the years 1930, 1932, 1933, and 1934, and under cage conditions in 1933.

Incubation period of peach yellows in its insect vector, A. HARTZELL (*Contrib. Boyce Thompson Inst., 8 (1936), No. 2, pp. 113–120, fig. 1*).—The incubation period of the virus of peach yellows in its leafhopper vector *Macropsis trimaculata* Fitch was determined approximately under greenhouse conditions. "Since the interval between successive transfers of the individual insects from tree to tree was necessarily comparatively long, a very precise determination of the period cannot be made.

"Nymphs were allowed to feed on diseased seedling peach trees for periods of 1, 4, 7, and 10 days prior to being placed on healthy trees. Nymphs of the 4-day series only became infective. The maximum incubation period of the virus of peach yellows as experimentally determined was found to range from 10 to 26 days, with an average of 16 days. The minimum period in one instance was from 7 to 8 days. All positive infections were obtained with insects that had become infected as nymphs and were allowed to feed on healthy trees during the nymphal stage, except in one instance in which the leafhoppers had transformed to adults while feeding on healthy trees during successive transfers. The maximum period in this case was 26 days."

A new species of Cicadulina China (Homoptera, Jassidae) injurious to maize in Tanganyika Territory, W. E. CHINA (*Bul. Ent. Res., 27 (1936), No. 2, pp. 251, 252, fig. 1*).—A jassid injurious to maize in Tanganyika is described as new under the name *C. storeyi*.

The periodical cicada, J. A. HYSLOP (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 671–676*).—Attention is called to the importance of the periodical cicada as an insect pest, and observations made during its recent occurrence are reported upon.

Control of aphids on citrus, J. R. WATSON (*Citrus Indus., 17 (1936), No. 3, pp. 13, 14*).—A practical discussion of citrus aphid control.

Reconditioning aphids for study, E. O. ESSIG (*Science, 84 (1936), No. 2167, pp. 47, 48*).—The author reports having found in clearing aphids in potassium hydroxide for microscopical study that dried specimens were not only restored to much of the original form but were also rendered clear and partly transparent. Remnants of aphids mounted on points were safely transferred to permanent slide mounts, where they are available for convenient study without danger of mutilation. "Permanent slide mounts of years' standing may also be reconditioned by first removing the balsam by submerging the slides in xylene or in [J. G.] Carlson's solution consisting of 90 parts of xylene and 10 parts of *n*-butyl alcohol. The opaque specimens may then be cleared in potassium hydroxide as aforementioned, washed, dehydrated, and remounted."

Observations on the mealy bug Phenacoccus aceris Sig., F. C. GILLIATT (*Canad. Ent., 68 (1936), No. 6, p. 133*).—This account of the life history of *P. aceris* supplements that previously noted (E. S. R., 74, p. 70).

Pyrethrum extract tested on red scale, R. H. SMITH (*Calif. Citrogr., 21 (1936), No. 8, p. 287*).—Tests of kerosene extract on California red scale in

California confirm the results of earlier experiments and appear to be conclusive in indicating that pyrethrum is not particularly toxic to the red scale. It is considered remarkable that red scale should possess such a great tolerance for this insecticide.

Some observations on two scale insects injurious to mango flowers and fruits, F. Q. OTANES (*Philippine Jour. Agr., 7 (1936), No. 1, pp. 129–141, pls. 7*).—Observations of two nondiaspine scale insects, namely, *Puto spinosus* Robinson and *Coccus mangiferae* Green, which have been found harmful to young growths, flowers, and fruits of mangoes, especially at Novaliches, Rizal, are reported upon. A list of 21 references to the literature cited is included.

Anartia jatrophae L. in Texas, H. B. PARKS (*Bul. Brooklyn Ent. Soc., 30 (1935), No. 2, p. 83*).—The finding and observation of the white peacock butterfly *A. jatrophae* in Texas led to the conclusion that it is gregarious, that its native habitat must be in the deep shade of the forests in Mexico and southward, and that the specimens captured wandered or were driven in by Gulf storms.

The distribution and sampling of insect populations in the field with special reference to the American bollworm (Heliothis obsoleta Fabr.), J. MARSHALL (*Ann. Appl. Biol., 23 (1936), No. 1, pp. 133–152, figs. 4*).—The results of investigations conducted with the bollworm at Barberton, Union of South Africa, are reported.

The effect of humidity on the development of the webbing clothes moth (Tineola bisselliella Hum.), G. H. GRISWOLD and M. F. CROWELL (*Ecology, 17 (1936), No. 2, pp. 241–250, figs. 3*).—Experiments were conducted at a constant temperature of 25°±1° C. and at relative humidities of 20, 32, 43, 75, and 93 percent. A relative humidity of 75 percent proved to be the most favorable for the development of the webbing clothes moth. This was evidenced by the fact that (1) the life cycles for both males and females were shorter than those obtained in any of the other humidities, (2) the highest percentage of larvae completed their development and emerged as adults, and (3) the adults, both males and females, lived longer than did those in any other humidity.

Influence of certain factors on oviposition responses of the cherry casebearer, J. H. LILLY (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 710–713*).—The cherry casebearer has been found by the Wisconsin Experiment Station to oviposit more readily on unsprayed cherry trees, less abundantly on those treated with sulfur fungicides, and least readily on bordeaux-sprayed trees. "Cherry trees in good vegetative condition (fertilized with nitrogen, heavily pruned, and young) are more conducive to casebearer oviposition than are 'normal' checks. Heavily infested leaves tend to turn yellow and fall while the young larvae are feeding, a reaction which often serves materially to reduce large casebearer populations on cherries and certain varieties of apples. Theoretically the effect of fungicidal spray residues in reducing casebearer oviposition may be due to physical, chemical, or combined physical and chemical properties."

What is happening to the codling moth? L. HASEMAN (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 646–648*).—In this discussion (E. S. R., 71, p. 349), contributed from the Missouri Experiment Station, the factors which may have influenced the earlier (1925 through 1933) increase of the codling moth in Missouri and the later decline of population are considered.

Brood study of the codling moth for one decade, T. J. HEADLEE (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 639–646, figs. 3*).—The information here contributed from the New Jersey Experiment Stations is based upon work reported in Bulletin 605, previously noted (E. S. R., 75, p. 813).

Eight seasons' tests in codling moth control in Michigan, F. SHERMAN III (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 653–655*).—In work conducted by the

Michigan Experiment Station commencing in 1928, it was clearly demonstrated that arsenate of lead used intelligently may be depended upon to control the codling moth. Applications of calcium arsenate must be made more often than is necessary with lead arsenate. Zinc arsenate gave decided promise as a substitute for lead arsenate. Six seasons' tests of summer oil-nicotine sulfate have shown that when used intelligently this combination spray affords good protection from the codling moth, although more frequent applications are necessary than when arsenate of lead or zinc arsenate are used. The importance of supplementary control measures, including scraping and banding, with attention to hibernating larvae in storehouses, packing sheds, cider mills, and apple crates which are stored near the orchards, is emphasized.

New method of codling moth control in theory and practice, G. E. Marshall (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 669–671*).—The program here suggested by the Indiana Experiment Station offers in theory and the experience of 2 years' practice a simplified method of codling moth control.

Bait trap records over a period of 3 yr. in southern Indiana having shown more than 99 percent of the spring brood adults to emerge before June 20, it was concluded that if sprays were applied and the entrance of larvae before that date prevented, the emergence and subsequent hatch would be of little importance.

"With normal activity the less than 1 percent of the first brood hatching after June 20 could not produce a destructive third brood. Therefore, if spraying is discontinued after June 20, there will be a good cover of material that would remain effective over a considerable period, inasmuch as the same rapid weekly area increase, so noticeable during May and the first half of June, would not continue. From this time till harvest, with no more spraying, a considerable amount of the residue would gradually weather off. The situation thus described would be dependent on absence of any heavy infestations in adjacent orchards.

"The prevention of practically all entries till after June 20 would necessitate thorough and heavy applications made to the inside and outside of the trees beginning 7 days after the calyx spray, as practiced in 1935. The second cover should come 7 to 10 days after the beginning of the first and so on till 4 or 5 covers have been applied before June 20. There need be no timing, no variation in the amount of summer oil used after lime-sulfur is discontinued, which is usually the second cover spray, and at present no concern as to the possibility of difficulties in the residue removal if efficient washing methods are employed."

It is pointed out that such a program fits in admirably with the control of other insects as well as blotch, fire blight, bitter rot, and other diseases. The use of this program during the last 2 yr. in southern Indiana, where three broods of codling moth normally occur, indicates that a careful study should be made of the amount of soap to be added. Applied to plats of Grimes and Winesaps, infestation was reduced from more than 125 worms per 100 apples in 1933 to 1.63 worms per 100 in 1934. An 8-acre orchard that had been a commercial failure due to codling moth infestation since 1928 was sprayed with the lead arsenate-summer oil-soap combination, resulting in a reduction of from 65 to 95 worms and 150 stings per 100 apples in 1934 to 1.3 worms and 4 stings per 100 apples in 1935.

Three-year study of calcium arsenate for codling moth control, J. Marshall and K. Groves (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 658–669*).—Certain calcium arsenate mixtures are said to have been successfully used during the last 3 yr. (1933–35) by the Washington Experiment Station (E. S. R., 74, p. 521) in experimental work in spraying for codling moth control in the arid

Wenatchee Valley. Their effectiveness was judged in comparison with lead arsenate used alone or with the addition of herring oil.

"Where equal or greater deposits of calcium arsenate have been maintained, codling moth control has compared favorably with lead arsenate used alone or with herring oil. However, without added petroleum oils it has been more difficult to maintain a satisfactory deposit with calcium arsenate than with lead arsenate. Calcium arsenate alone has resulted in severe injury, but the addition of small amounts of zinc sulfate and calcium hydrate has remedied the difficulty. Animal and vegetable oils with calcium arsenate have caused exceedingly severe arsenical injury. Highly refined petroleum oil has largely prevented arsenical injury when applied with calcium arsenate. It has also increased the arsenical deposit and improved codling moth control. Heavy petroleum oil produced a greater arsenical deposit and better codling moth control than medium oil. Petroleum oil of low unsulfonatable residue has not been satisfactory with calcium arsenate. Addition of small amounts of zinc sulfate and calcium hydrate to calcium arsenate-petroleum oil has appeared advisable in order to provide a suitable margin of safety from arsenical injury. Ammonium caseinate (paste) emulsion of petroleum oil used with calcium arsenate has resulted in an undesirable spotted deposit of arsenical. It has been found possible to avoid this, at the same time increasing the deposit, through the use of an organic soap emulsion of oil in the presence of a small amount of zinc sulfate. Investigation of this type of mixture is still in the preliminary stage.

"Residue removal with calcium arsenate has not been as difficult as with lead arsenate similarly used. At present it appears that in districts with little or no summer rainfall commercial calcium arsenate may be substituted for lead arsenate in codling moth control providing certain substances are added. Any grower wishing to try a calcium arsenate mixture should at first do so only in a limited way.

"The cost of suitable calcium arsenate spray mixtures has been fairly similar to that of lead arsenate mixtures."

Substitutes for lead arsenate in codling moth sprays, C. G. VINSON (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 655–658*).—In work at the Missouri Experiment Station an iron arsenate-calcium arsenate combination controlled codling moth on Collins Red variety in 1934 and caused no more arsenical injury than lead arsenate. In 1935, when applied to the Ben Davis variety, it failed to control codling moth and caused severe arsenical injury to the foliage. Lloyd's reagent with nicotine sulfate did not give as good control of the codling moth in 1934 as lead arsenate, but when used with a sticker in 1935 it gave approximately as good control as lead arsenate.

Preparing chemically treated bands for codling moth control, H. N. WORTHLEY and L. C. MARSTON, JR. (*Pennsylvania Sta. Bul. 330 (1936), pp. 15, figs. 4*).—The further experiments here reported (E. S. R., 71, p. 349; 74, p. 520) were conducted in 1935 in an attempt to correlate the physical and chemical properties of treated bands with their effectiveness in codling moth control. The consistency of the dipping mixture, method of dipping bands, and type of banding material employed were studied in relation to the weight of chemical coating produced, the clogging of tunnels, the loss of β-naphthol during exposure on the trees, and the killing power of the bands.

In band-dipping experiments the studies were confined to bands made by the cold-dip process because of the difficulties and dangers incident to the home preparation of hot-dipped bands. Cod-Ban, a factory-ground product containing 60 percent mineral oil and 40 percent crude β-naphthol, thinned with different

proportions of high-test gasoline that contained no tetraethyl lead, was used in the dipping mixture.

Due to the excessive clogging in the first of two series of dipping tests, only the second is reported upon. The details of the work, including weight and nature of chemical coatings produced on corrugated strawboard bands of 2-in. width and the results obtained in codling moth control by these bands, are presented in tables. The loss of weight and β-naphthol in such bands exposed on the trunks of apple trees, the effect of dipping method on the retention of chemicals in the bands, and the nature and effectiveness of treated bands as influenced by (1) consistency of the dipping mixture, (2) method of dipping, and (3) type of corrugated paper are also detailed in tables.

In dipping work the least uniform results followed complete immersion in dipping, while the thickest dipping mixture produced the heaviest loads at the expense of a considerable proportion of clogged tunnels. While the thinner mixtures produced lighter loads, these were increased by double dipping without undue complication from clogged tunnels. No consistent difference in favor of either the jute- or the kraft-faced band was evident. With complete immersion the kraft band appeared to retain more of the dipping mixture and clogged to a greater extent than the jute when the thickest mixture was used.

In the banding work 11,489 codling moth larvae (an average of 48 per tree) were trapped during the season. Sixty-seven percent of the larvae were found in the treated half bands. Of these, 66 percent were dead and 1.2 percent had completed development and emerged as moths, leaving the empty pupa skins behind. Thirty-three percent of the larvae were found in the untreated half bands. Of these, 3.3 percent were dead and 14.6 percent had completed development and produced moths.

It is pointed out that the use of bands on apple trees where spraying alone has failed to reduce heavy codling moth infestations has yielded gratifying results at moderate cost, and that it is often possible by banding to trap and kill 90 percent of the worms and thus remove before the beginning of the following season a serious handicap to effective spraying.

Large-scale test of orchard sanitation to control codling moth.—Progress report, L. F. Steiner and A. J. Ackerman (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 648–653*).—Sanitary measures which involved a thorough ground clean-up, removal of all rough bark and split branches, and the use of chemically treated bands were applied by the authors to half of a 40-acre orchard of 31-year-old apple trees in southern Indiana during 1934 and 1935.

"The early destruction or removal of ground debris apparently reduced the injury by the apple flea weevil (*Orchestes pallicornis* Say) and the apple scab in the treated area to such an extent that in 1934 this area produced 59 percent and in 1935 19 percent more fruit than the uncleaned block. In 1934 the operations resulted in an average reduction in worms per 100 apples of 41.9 percent. Only a 13.5 percent reduction in worms per tree was effected, however, because of the much larger crop. In 1935 the total injuries per 100 fruits was reduced 47.7 and 66.5 percent, respectively, for the Ben Davis and Collins varieties, whereas the reduction in average number of injuries per tree was 29.5 and 60.7 percent. The average reduction in injuries per 100 apples for both varieties was 57.1 percent, and for injuries per tree 45.1 percent. The 10-acre half of the cleaned area farthest from the uncleaned block had 64.5 percent fewer injuries per 100 apples and 43.2 percent fewer injuries per tree.

"Control during the second year may be conservatively estimated at 50 percent. In 1934 the bands captured 91,000 larvae, which is only 10 percent of the total number that entered fruit in the area but certainly a much higher per-

centage of those which normally would have remained in the orchard and completed their life cycle."

Oriental fruit moth control in quince plantings, D. M. DANIEL and J. A. COX (*New York State Sta. Bul. 669 (1936), pp. 16, figs. 9*).—The severe damage to the quince industry of western New York caused for a number of years by the oriental fruit moth, the failure to obtain biological control due to lack of twig infestation, and the experience with peach plantings led to the experimental work with insecticides in 1933, 1934, and 1935 here reported upon.

The program suggested consists of "seven applications of (1) lead arsenate (3 lb.) plus some sticker or spreader, or (2) summer oil (1 gal.) plus nicotine sulfate (1 pt.), or (3) Black Leaf 155 (6 lb.). In each of the above alternatives the applications are to begin at the calyx and are repeated every 2 weeks throughout the season, the last spray to be applied approximately 1 mo. prior to harvest."

The primary considerations which governed the formulation of the spray schedule are the fact that the caterpillars hatch throughout the entire season until harvest time and that the maintenance of complete coverage by spray materials is required to prevent the entrance of the worms into the fruit.

Tests on baits for oriental fruit moth, 1935, S. W. FROST (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 757–760*).—Studies conducted by the Pennsylvania Experiment Station in continuation of those for 1934, previously noted (E. S. R., 73, p. 355), are reported upon, the results of tests of 55 chemicals as attractants for the oriental fruit moth being given in a table.

"The captures for 1935 were very low compared with preceding years and the results therefore not as conclusive. Acids hold a prominent place as attractants for the adults of the oriental fruit moth. Oleic acid, U. S. P., and oleic acid, linolic free, were more attractive than commercial oleic acid. This is strange, since linolic acid was very attractive and linseed oil stood among the 10 best materials for 1935. Linalool and propyl acetate, which ranked high in 1934, do not appear in the list for 1935. These variations may be due to seasonal conditions, some materials working better at higher temperatures than others. Conclusions on this point will be reached after the chemicals have been tried for several successive seasons.

"Other materials such as eucalyptol, linalyl acetate, and cinnamene lend some promise."

Relative resistance of selected strains of corn to European corn borer, G. A. FICHT (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 687–691*).—In the resistance studies by the Indiana Experiment Station reported upon the corns used were chiefly hybrids, with a few inbreds, open-pollinated varieties, and top crosses, selections being made to provide a wide variety of plant characters which might have a bearing on resistance. The procedure followed consisted in the routine counting of egg masses naturally laid upon the plants and the determination of the average number of eggs per mass. The details are given in four tables.

Three factors affecting laboratory rearing of European corn borer larvae, R. MATHES (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 691–697, figs. 2*).—A food combination consisting of 1-in. sections of cut string beans followed by green peas in the pod with cut ends was found to be most satisfactory in the laboratory rearing of European corn borer larvae.

"The effect of crowding in a rearing tray was to decrease the size of the borers when the number of larvae was increased beyond 100 and to increase the mortality as the number of larvae was raised from 200 to 300 or 400 per tray. Air circulation within the rearing trays as obtained in those trays with solid tops and screen bottoms and those with screen tops and screen bottoms,

both being subjected to air currents produced by an electric fan operating 8 hr. a day beginning with the fifth day, proved most satisfactory. Less air movement resulted in molding and decomposition of food, while a greater circulation caused the food to become dry, hard, and unsuitable for the growing larvae."

Liquid applications to control peach borer and lesser peach borer, S. C. Chandler (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 754–756*).—The results of three seasons' tests in southern Illinois with liquid applications, including paradichlorobenzene dissolved in miscible oils, and dichloropentane for control of the peach borer and the lesser peach borer are summarized in tables.

The practical value of liquid treatments for the peach borer was not demonstrated, the cost being much greater than that of crystalline applications. With the lesser peach borer only a poor control was obtained, paradichlorobenzene dissolved in 1 gal. of Dendrol and diluted with water to contain 2 oz. of paradichlorobenzene per pint being the most promising (82 percent kill).

The American species of Psychoda (Diptera: Psychodidae), F. del Rosario (*Philippine Jour. Sci., 59 (1936), No. 1, pp. 85–148, pls. 6, fig. 1*).—This synopsis of the genus *Psychoda*, in which the author recognizes and describes 39 forms (5 being new), includes a synoptic table for the American species of the genus.

Occurrence and sequence of mosquitoes in southeastern Arkansas in 1935, W. R. Horsfall (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 676–679*).—The data here presented indicate the sequence and distribution of the more common species of mosquitoes (23 in number) in the coastal plain of Arkansas.

Mineral oils as mosquito larvicides, D. R. P. Murray (*Bul. Ent. Res., 27 (1936), No. 2, pp. 289–305*).—In the work reported, "it is shown to be desirable to have an oil which readily penetrates the tracheae of larvae. Actual toxicity is a secondary matter, for the presence of oil prevents ordinary development. The best penetrating oils are shown to be of a medium boiling range (with suitable modification for temperature), not involatile enough to be markedly viscous, and not volatile enough to give that immediately irritating effect which causes the larva to collapse its tracheae and dive without receiving a dose of the oil. Other conditions which prevent or hinder normal oiling of the tracheae have also been discussed, together with their bearing on the at present accepted views as to what are desirable features for a larvicidal oil."

Hordeum grasses as hosts of the hessian fly, E. T. Jones (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 704–710, figs. 2*).—It has been found that due to susceptibility to infestation, wide distribution, and life habits similar to winter wheat, *H. pusillum* is an important potential host capable of maintaining populations of the hessian fly in the absence of wheat. "*H. pusillum* is slightly less attractive than wheat for oviposition by the hessian flies reared from wheat, but is more attractive than *H. jubatum*, *Aegilops cylindrica*, *Elymus virginicus*, *Bromus secalinus*, *B. tectorum*, and Oregon or Italian ryegrass. It is probable that host selection is an influencing factor. Puparia produced on *H. pusillum* grown under semiarid conditions are smaller than puparia from wheat. However, plants grown in moist soil produce normal puparia. Pot tests involving a total of 15 strains of *H. pusillum*, *H. jubatum*, *H. nodosum*, *H. murinum*, *H. maritimum*, *H. gussoneanum*, and *H. spontaneum* reveal these wild grasses to be fly hosts but varying somewhat in their susceptibility."

Pupal period of the hessian fly, H. H. Walkden (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 701–704*).—In observations made of 328 hessian fly pupae in Kansas in 1923, 1924, 1927, and 1928 the pupal period ranged from 6 to 33 days. The pupal period for fall-emerging flies was much less than for spring-emerging

flies. The length of the pupal period is largely influenced by the temperatures prevailing during that period.

The sorghum midge in the Anglo-Egyptian Sudan, J. W. COWLAND (*Ann. Appl. Biol., 23 (1936), No. 1, pp. 110–113, pl. 1*).—A short account is given of the distribution, life history, and damage and control of the sorghum midge in the Anglo-Egyptian Sudan, from which it is reported for the first time.

Synopsis of the Tabanidae of New York, their biology and taxonomy.—I, The genus Chrysops Meigen, B. SEGAL (*Jour. N. Y. Ent. Soc., 44 (1936), Nos. 1, pp. 51–78; 2, pp. 125–154*).—A contribution on the economic importance and methods of control, habits, breeding methods, etc., with descriptions of the life stages and keys to the immature stages and adults of the New York species of *Chrysops*, which precede descriptions of species of the genus.

The author has fonnd an apparent "preference among the various species for certain specific parts of the host body. Some prefer the lobe of the ear, others the back of the hand, or various other exposed parts of the body. *Chrysops* species are not common on cattle, but they molest horses, and in the Tropics they torture the elephant and the lion, and the reindeer, as well as man."

A list of 38 references to the literature is included.

The Stratiomyidae of Colorado and Utah, M. T. JAMES (*Jour. Kans. Ent. Soc., 9 (1936), Nos. 1, pp. 33–36; 2, pp. 37–48*).—Keys are given to the subfamilies, genera, and species of the dipterous family Stratiomyidae known to occur in Colorado and Utah.

New genera and species of American muscoid flies (Tachinidae: Diptera), H. J. REINHARD (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 160–173; abs. in Texas Sta. Circ. 78 (1936), p. 19*).—The tachinid genera *Politomyia*, *Pantagathus*, and *Torosomyia* are erected, and 10 species from the United States and Mexico are described as new.

Notes on the tachinid genus Pseudotachinomyia, with descriptions of two new species (Diptera), H. J. REINHARD (*Ent. News, 46 (1935), No. 5, pp. 132–135; abs. in Texas Sta. Circ. 78 (1936), p. 22*).—A discussion of the generic characters of the tachinid genus *Pseudotachinomyia*, with a key to the species, three in number, of which two are described as new.

Studies on the higher Diptera of medical and veterinary importance: A revision of the genera of the family Muscidae Testaceae Robineau-Desvoidy based on a comparative study of the male and female terminalia—the genus Cordylobia Grünberg (sens. lat.), W. S. PATTON (*Ann. Trop. Med. and Parasitol., 30 (1936), No. 1, pp. 57–69, figs. 8*).—This is a continuation of the contribution previously noted (E. S. R., 73, p. 816).

Studies on the higher Diptera of medical and veterinary importance.—A revision of the species of the genus Glossina Wiedemann based on a comparative study of the male and female terminalia, W. S. PATTON (*Ann. Trop. Med. and Parasitol., 30 (1936), No. 1, pp. 71–89, figs. 22*).—This is a continnation of earlier studies (E. S. R., 74, p. 824).

Relation of soil utilization to wireworm injury, J. H. HAWKINS (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 728–731*).—Experimental data obtained by the Maine Experiment Station indicate that "the common field crops grown in Maine are affected least when they are grown where the wireworm population is consistent with the safety of the crop planted. Fortunately this practice, in addition to its value for keeping injuries done to crops by wireworms at a minimum, usually adjusts the crop to a soil type well adapted to its growth."

Studies on cucumber beetle control in 1935, G. E. GOULD (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 731–735*).—It was found by the Indiana Experiment Station that in a season of frequent rains and an abundance of the cucumber

beetle, which necessitated repeated applications of control methods, certain mixtures containing copper fungicides in addition to an arsenical showed decided promise for both beetle and cucurbit wilt control. "While the cost of materials in sprays was considerably less than dusts, a copper oxychloride-calcium arsenical mixture in both dust and spray forms gave significant increases in yield over the standard 1:9 calcium arsenate-gypsum dust and check plats. Treatments containing barium fluosilicate, zinc arsenite, hydrated lime, and copper-lime dust had definite injurious effect upon the cucumber plants."

The early embryological development of the parthenogenetic alfalfa snout beetle Brachyrhinus ligustici L., F. H. BUTT (*Ann. Ent. Soc. Amer., 29 (1936), No. 1, pp. 1–13, figs. 26*).—This contribution is presented with a list of 16 references to the literature.

Larger apple curculio in Wisconsin, P. O. RITCHER (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 697–701*).—Work with the larger apple curculio *Tachypterellus quadrigibbus magnus* List, conducted by the Wisconsin Experiment Station in the Kickapoo Valley district during 1934–35, is reported upon. Most of the injury caused by this pest is the result of its spring feeding and the egg punctures made when the apple fruits are from 0.25 to 1 in. in diameter. When further growth occurs, probably because of injury to the vascular system, only the tissue surrounding each puncture grows and a crater is gradually formed with the old puncture at its bottom.

Two parasites, *Microbracon tachypteri* Mues. and *Eurytoma tylodermatis* Ashm., were found parasitizing the larvae in one lightly sprayed orchard, ranging from 40 to 63 percent in Wealthy drops beneath trees bordering a woods. In the laboratory the application of lead arsenate 3:50 with 1 lb. of dried milk reduced new-generation curculio feeding by 65 percent and killed 27 percent of the beetles. Counts of spring and summer injury made in 1935 on 14 trees heavily infested in 1934 showed a total reduction of from 25 percent of injured fruit in 1934 to 7 percent in 1935. The experiments conducted suggest that the application of a good repellent at the critical spring period might be of great benefit. It is concluded that the wholesale removal of wild hosts would not reduce the number of curculios now in apple orchards but might actually increase the population by forcing over curculios that would normally confine themselves to the wild host.

Curculionidae (Col.) attacking cultivated plants, G. A. K. MARSHALL (*Bul. Ent. Res., 27 (1936), No. 2, pp. 253–259, figs. 2*).—Five curculionid weevils injurious to cultivated plants in Africa and two in south India are described as new to science.

Notes on biologies of nut infesting weevils, O. KUMPE and D. ISELY (*Jour. Kans. Ent. Soc., 9 (1936), No. 1, pp. 13–16*).—An account is given of a cursory study made from 1930 to 1933 of nut weevils in northwestern Arkansas, in which State a combination of species destroys from 50 to 90 percent of the acorn crop. Notes are given on six species of *Curculio* (*Balaninus*) that have been reared, four, including *C. pardalis* Chittn., *C. baculi* Chittn., an undetermined species near *C. parvidens* Chittn., and the chestnut weevil from acorns; one, *C. auriger* Casey, from chinquapin; and one, the pecan weevil, from hickory. In addition, a species of *Conotrachelus* was found associated with the species of *Curculio* attacking acorns. A species of *Conotrachelus* was also reared from hickory nuts and another from walnuts; both of these were summer pests causing an early drop but did not occur in the nuts at harvest, and consequently are not associated with weevils of the genus *Curculio*.

The life cycle of but three species of *Curculio* have been reported in detail, these by Moznette, Bissell, and Adair (E. S. R., 64, p. 749). Reference is also made to the life history studies by Brooks of *Conotrachelus* attacking walnuts

and hickories in West Virginia (E. S. R., 23, p. 261) and of *Curculio* (E. S. R., 47, p. 556; 62, p. 250).

Ants—how to combat them, W. P. Flint and W. E. McCauley (*Illinois Sta. Circ. 456 (1936), pp. 8, figs. 2*).—A description is given of some of the common kinds of ants occurring in and about Illinois houses and the best means known for combating them.

A list of the ants of Texas, M. R. Smith (*Jour. N. Y. Ent. Soc., 44 (1936), No. 2, pp. 155–170*).—A list is given of 172 ant forms with records of their occurrence in Texas.

The genera of parasitic wasps of the braconid subfamily Euphorinae, with a review of the Nearctic species, C. F. W. Muesebeck (*U. S. Dept. Agr., Misc. Pub. 241 (1936), pp. 38, figs. 2*).—Following a brief introduction, a presentation of the synonymy of the subfamily Euphorinae, its classification, and a key to the genera, 14 genera are recognized, and the forms by which they are represented, including a total of 12 new species and 11 new combinations, are considered.

Meteorus Haliday is said to be the largest and best-known genus of the subfamily and to contain a number of species that are of appreciable economic importance in the control of certain injurious insects. Most of the species the habits and biology of which have been investigated are internal parasites of lepidopterous larvae, as, for example, *M. vulgaris* (Cress.), a common gregarious parasite of cutworms; *M. hyphantriae* Riley, an abundant polyphagous species; *M. loxostegei* Vier., a parasite of the beet webworm and other pyralids; and *M. versicolor* (Wesm.), imported from Europe to aid in the control of the brown-tail and satin moths. Certain other species of *Meteorus* are parasites of coleopterous larvae. These have been less thoroughly investigated, but this host association has been definitely established for some forms. All other genera of the subfamily the habits of which are known are internal parasites of adults of Coleoptera, or of the nymphs or adults of Heteroptera.

A preliminary report on the use of the egg parasite Trichogramma minutum Riley for the control of the sugarcane borer, H. A. Jaynes and E. K. Bynum (*Sugar Bul., 14 (1936), No. 19, pp. 1–4*).—The authors report that none of the following factors showed any consistently beneficial results from *T. minutum* releases for control of the sugarcane borer: "Increase in the percentage of parasitization of borer egg clusters; decrease in the percentage of infested stalks or of borer-damaged joints in the total cane; increase in yield of sugar per ton of cane; increase in tons of cane per acre; [and] increase in pounds of sugar per acre. Thus, the results of these experiments conducted during the past three seasons show that releases of *T. minutum* are of no value as a control for the sugarcane borer in Louisiana. The colonization of *Trichogramma* as a field practice for the control of the sugarcane moth borer is therefore not recommended."

A biometrical study of two morphologically similar species of Trichogramma, M. F. Bowen (*Ann. Ent. Soc. Amer., 29 (1936), No. 1, pp. 119–125, figs. 4*).—A comparison is made of the productivity, longevity, and developmental period of two structurally similar species of *Trichogramma*, when both are subjected to similar environmental (experimental) conditions. One of the species is from Massachusetts, in which the general color of the females is light yellow and the males a dark olivaceous brown, and the other from Louisiana, in which the general coloration of both the males and the females is a dark olivaceous brown.

Statistically significant differences in productivity, longevity, and developmental period were found. Cross-breeding tests demonstrate that they are not interfertile. Since both species were at the same time reared under the same

conditions, the differences noted are believed to be hereditary. Under the conditions of this study the Massachusetts species exhibits greater variability than the Louisiana species in all the characters studied except developmental period.

Investigations on Trichogramma lutea Gir. as a parasite of the cotton bollworm (Heliothis obsoleta Fabr.), F. S. PARSONS and G. C. ULLYETT (*Bul. Ent. Res., 27 (1936), No. 2, pp. 219–235, figs. 5*).—Some of the problems involved in the estimation of parasitism in populations of bollworm eggs by *T. lutea* in the Union of South Africa are discussed. Investigations in rain-grown crops are described, and results are quoted from a typical experiment in maize wherein the percentages of parasitism recorded in a large number of equal sections of the crop are regressed on proportionate larval survival. Although the egg parasitism ranged from 21.2 to 82.3 percent, differences in larval populations were inappreciable. An explanation for this is offered in an analysis of the effect of various mortality factors. It is pointed out that another egg parasite, *Phanurus ullyetti* Nixon, is prevalent before *T. lutea* appears and accomplishes much that was hoped for from the attempted earlier introduction of *Trichogramma*.

Two new egg-parasites of Batocera (Col., Lamiid.) in Malaya, C. FERRIÈRE (*Bul. Ent. Res., 27 (1936), No. 2, pp. 331–333, figs. 3*).—A chalcid reared from eggs of *B. rubus* L. in Malaya is described as new under the name *Louricia ovivora* n. g. and n. sp., and another as *Ooencyrtus batocerae* n. sp.

The physical ecology of Microplectron fuscipennis Zett. (Hym., Chalc.), G. C. ULLYETT (*Bul. Ent. Res., 27 (1936), No. 2, pp. 195–217, figs. 13*).—This contribution deals with the chalcid *M. fuscipennis*, an important parasite of the pine sawfly (*Diprion sertifer* Geoff.) in Europe and now being introduced into the Gaspé Peninsula of Canada to combat the spruce sawfly (*D. polytomum* Htg.).

Heat treatments for control of bulb mite on tuberose, C. A. WEIGEL and R. H. NELSON (*Jour. Econ. Ent., 29 (1936), No. 4, pp. 744–749*).—In small-scale tests made by the authors during 1934 it was found that treating tuberose (*Polianthes tuberosa*) bulbs in hot water at 110° F. for 1 hr., or with vapor heat at 114° for 1 hr., is completely effective against all stages of the bulb mite. "The treatments that were found to be effective against the root-knot nematode (*Heterodera marioni*) (hot water at 116° for 1 hr., 118° or above for 0.5 hr., and vapor heat at 122° for 0.5 hr.) are therefore also effective against the bulb mite.

"Tolerance tests with both types of treatments at the temperatures and durations herein indicated have shown that the dormant bulbs of either the flowering size or planting stock are not adversely affected, and that application of treatments on a commercial scale is practical."

Latrodectus geometricus Koch in southern Florida, J. F. W. PEARSON (*Science, 83 (1936), No. 2161, pp. 522, 523*).—Attention is called to the occurrence of *L. geometricus* in southern Florida, where it is thought to be the dominant form of the genus. It appears to be less aggressive than *L. mactans*.

ANIMAL PRODUCTION

[Investigations with livestock in Arizona] (*Arizona Sta. Rpt. 1935, pp. 36–43, 86–89, 90*).—Studies with beef cattle yielded data on the mineral deficiencies of Arizona range grasses, seasonal changes in the chemical composition of range grasses, foraging habits of cattle, and a study of the relation of type and conformation to the economy of gain and killing qualities of range steers.

Poultry tests supplied information on the effect of backcrossing and reciprocal crosses on egg production in the offspring, locally produced grains in the

poultry ration, environmental factors and their effect on the natural egg cycle, and a comparison of certain local Arizona feeds.

[Livestock investigations in Kentucky] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 14–16, 33–39, 59, 60, 62, 63*).—Beef cattle tests yielded information on the feeding value of No. 1 Korean and *Lespedeza sericea* hays; the cost of producing beef; and gain and economy of finishing cattle in the barn and on pasture, and pasture production at the Western Kentucky Substation.

Tests with swine produced results on the cost of producing pork, pasture for swine, and distillery slop for hogs.

Results obtained in sheep studies are reported on rye pasture v. bluegrass pasture for ewes with lamb, roughages for bred ewes, and cost of producing lambs.

Poultry experiments yielded data on the effect of age of breeding stock and crossbreeding in the turkey, vitamin D and embryo development, the lipoid phosphorus, iron, and copper contents of egg yolk, starting and laying rations for chicks at the Robinson Substation, and high and low protein rations for chicks at the Western Kentucky Substation.

Results are also noted from studies of the arsenic content of the tissues of rats and baby chicks and of the effect of boron on the growth of rats.

[Livestock investigations in Tennessee] (*Tennessee Sta. Rpt. 1935, pp. 18–21, 30*).—Results obtained in tests with beef cattle are reported on the value of adding dicalcium phosphate to a standard steer-feeding ration; on the amount of grain necessary to feed 2-year-old steers being finished on grass, the value of different ways of feeding corn grain to baby beeves, and whether winter finishing of baby beeves was profitable at the Middle Tennessee Substation; and at the West Tennessee Substation on the amount of grain necessary for most economical finishing of baby beeves, all by M. Jacob.

In cooperation with the U. S. D. A. Bureau of Animal Industry the Middle Tennessee Substation obtained information on the value of feeding grain to breeding ewes in the production of early spring lambs, by Jacob.

The results of analyses of corn-sorghum silage and of grass silage from concrete and trench silos are reported, by G. A. Shuey.

The effect of some reagents on the "filtrate factor" (a water-soluble vitamin belonging to the vitamin B complex and preventing a dietary dermatitis in chicks), S. Lepkovsky and T. H. Jukes (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 109–116*).—This contribution from the California Experiment Station has provisionally applied the name filtrate factor to the water-soluble vitamin, prepared from an aqueous extract of beef liver as previously noted (E. S. R., 75, p. 681), which prevents the dermatitis produced in chicks by feeding a heated diet of natural feeding stuffs.

This factor was not precipitated by barium hydroxide in aqueous or alcoholic solution and is not destroyed by bromine water, ferric chloride, dilute nitric acid, sodium bisulfite, hydrogen peroxide, or hydrogen sulfide, and only slightly reduced in potency by nitrous acid. It was partially inactivated by warming with sodium hydroxide and completely inactivated by warming with a mixture of ferric chloride and sodium hydroxide. Charcoal, lead sulfide, and fuller's earth failed to adsorb the factor from acid solution. Its curative effect on induced dermatitis in chicks was again demonstrated.

The distribution of the "filtrate factor" (a water-soluble vitamin belonging to the vitamin B complex and preventing a dietary dermatitis in chicks) in certain feedingstuffs, T. H. Jukes and S. Lepkovsky (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 117–121, fig. 1*).—Continuing this line of investiga-

tion, a tabulation of the relative values of several common feeding stuffs with respect to the filtrate factor is presented.

It is shown that growth rates in chicks on a suboptimal level of the filtrate factor were relatively proportional to the amount fed. The results indicated that by multiplying the percentage of each ingredient in the ration by its respective filtrate factor value and adding the products a rough estimate of the protective value of the ration may be obtained. If the sum is less than 1, a deficiency in the diet is indicated. Certain feeding stuffs have shown considerable difference in potency of the filtrate factor value and of the human P-P factor, indicating that these two may not be identical.

The provitamin D of heat-treated cholesterol, M. L. Hathaway and D. E. Lobb (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 105–110*).—The method of Hart et al. (E. S. R., 66, p. 595) was used to test on chicks the activity of provitamin D produced by heat treatment of cholesterol. The supplements to the ration were reference cod-liver oil (95 U. S. Pharmacopoeia units per gram), irradiated ergosterol in maize oil, crude cholesterol, purified cholesterol, and heated purified cholesterol. All the cholesterols were irradiated with ultraviolet light. The purified cholesterol was prepared from crude cholesterol through the use of dibromide, and a sample of it was heated in an oil bath at 200° C. for 2 hr. and then recrystallized from hot alcohol.

The results of a preliminary assay indicated that 1 Steenbock rat unit or 0.5 mg of crude cholesterol was effective in protecting the chick from rickets, but that the same number of units of purified cholesterol was ineffective. The results of further assays showed that 10 Steenbock rat units of cod-liver oil, irradiated crude cholesterol, or irradiated heated purified cholesterol per 100 g of food adequately protected the chick, and that 5 rat units did not give adequate protection except in the case of crude cholesterol. Irradiated ergosterol fed at levels of 100 Steenbock rat units per 100 g of ration was about equivalent to 5 rat units of heated purified cholesterol and 300 rat units to 10 of heated purified cholesterol. These results confirm the observations of Waddell (E. S. R., 72, p. 888).

This investigation has given evidence that the provitamin D of crude cholesterol was destroyed by purification through dibromide, and that a new provitamin was formed in the purified cholesterol by heat treatment. Levels of from 2.5 to 5 mg per 100 g of ration of heat-treated purified cholesterol completely protected the chick. As shown by the chick, the vitamin D of irradiated, heated, and purified cholesterol has properties resembling more closely the natural vitamin D of cod-liver oil than that of irradiated ergosterol.

The comparative antirachitic activity of several fish liver oils and other sources of vitamin D for the chicken and the rat, A. Black and H. L. Sassaman (*Amer. Jour. Pharm., 108 (1936), No. 6, pp. 237–243*).—In a series of comparative tests with rats and chicks, it appeared that on the basis of U. S. P. XI D units, tuna fish oils are approximately one-half as active as liver oils of cod, swordfish, halibut, and mackerel, and irradiated cholesterol D, each of which contain vitamin D with about the same activity for chickens. Irradiated phytosterol, or unsaponifiable matter from alfalfa, was similar to irradiated ergosterol in its activity.

An experimental study of the relation between the uropygial gland and vitamin D deficiency in chicks, E. F. Murphy (*Jour. Agr. Res. [U. S.], 53 (1936), No. 1, pp. 67–71, fig. 1*).—In this study at the Maine Experiment Station, the uropygial glands were removed from 50 of 100 Rhode Island Red chicks at 2 weeks of age, the remaining 50 serving as normal controls. Each of the two groups was divided into five lots of 10 chicks each and placed on experi-

ment at 3 weeks of age, all lots receiving the same basal rachitic ration. One lot from each group was subjected to one of the following treatments—no source of vitamin D, prophylapsis in the form of 5 min. daily ultraviolet irradiation (considered suboptimum) or in the form of 0.5 percent of cod-liver oil in the ration, or a curative treatment following 5 weeks on a rachitic diet in the form of 20 min. daily ultraviolet irradiation or 0.5 percent of cod-liver oil in the ration.

In each instance weekly growth rates of the experimental and control lots followed practically parallel courses and bone analyses failed to show any significant differences in the total bone ash content between groups. It is concluded that the lack of the uropygial gland in chicks does not preclude the utilization of ultraviolet irradiation in the production of vitamin D.

Effect of manufacture on the quality of nonoily fish meals, R. W. HARRISON, A. W. ANDERSON, and S. R. POTTINGER (*U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., No. 30 (1935), pp. II+30, fig. 1*).—High drying temperatures were detrimental to the quality of nonoily fish meals for both protein and vitamin G values, particularly the latter, flame-dried meals proving decidedly inferior in quality. Removal of water extractives in the wet process of manufacture slightly improved protein quality, but decidedly lowered the vitamin G value of the resulting meal. The greater tonnage secured from dry rendering tended to offset the greater cost involved in this process. The advantages of vacuum drying over steam drying are more pronounced in the dry rendering than when the wet process is used.

Inspection of feeds, W. L. ADAMS and A. S. KNOWLES, JR. (*Rhode Island Sta. Ann. Feed Circ., 1936, pp. 15*).—The guarantees and analyses for protein and fat of 231 samples of commercial feeds collected for official inspection during 1935 are presented (E. S. R., 74, p. 243).

Weight losses in frozen foodstuffs: Chilling, freezing, and storage changes, M. W. TUCHSCHNEID (*Cold Storage, 39 (1936), No. 455, pp. 38, 42*).—In investigations by the Technological Laboratory of Leningrad, the freezing of beef caused weight losses of 1.2 to 1.7 percent; mutton, 1.8 to 2.2 percent; and fish, 2.2 to 2.8 percent. All foods studied, including meat, fish, poultry, eggs, butter, and fruit and vegetables, showed a constantly progressive loss in weight with increased length of the storage period.

Composition, digestibility, and nutritive value of samples of grassland products, S. J. WATSON and E. A. HORTON (*Jour. Agr. Sci. [England], 26 (1936), No. 1, pp. 142–154, figs. 3*).—This contribution from the Agricultural Research Station, Jealott's Hill, presents a tabulation of the composition, digestibility coefficients, and digestible nutrients of a large number of feeding stuffs classified as fresh grass, hays, silage, artificially dried fodders, and miscellaneous feeds. Curves are presented to permit the estimation of starch equivalent and protein equivalent values of feeds from the crude protein content as determined by analysis.

The composition and nutritive value of marrow stem kale and thousand head kale, H. E. WOODMAN, R. E. EVANS, and A. EDEN (*Jour. Agr. Sci. [England], 26 (1936), No. 2, pp. 212–238*).—This is a report of extensive composition studies and digestion trials on two important varieties of kale, conducted at the School of Agriculture, Cambridge.

Thousand headed kale is considerably higher in dry matter than the marrow stem kale but ordinarily yields considerably less green material per acre. In both varieties the marrow contains a high percentage of sucrose and invert sugar. Both varieties were characterized by a high protein content, relatively low fiber content, and a high percentage of mineral matter, particularly lime, chlorine, potash, and sulfur, being much superior to swedes in this respect.

The nutrients were found to be highly digestible, comparing favorably with young pasture grass, while on the basis of starch equivalent in the dry matter both varieties compared favorably with swedes.

Growth stimulating properties of grass juice, G. O. Kohler, C. A. Elvehjem, and E. B. Hart (*Science, 83 (1936), No. 2158, p. 445, fig. 1*).—In continuation of earlier studies (noted on p. 90), this note reports that young male rats receiving mineralized milk produced on winter rations grew an average of 2 g daily. When this milk was supplemented with 3 cc of fresh, clear Kentucky bluegrass juice, the rate of growth was increased to 4+ g per day. Water-soluble factors in the fresh tissues of the grass were considered responsible for stimulating the growth.

The latest methods of silage-making, P. D. Henning (*Farming in So. Africa, 11 (1936), No. 122, pp. 199–201, figs. 2*).—In silage-making experiments at the Stellenbosch-Elsenburg College of Agriculture lots of alfalfa were ensiled without preservative, with 2 percent and 3 percent of molasses, with mineral acid (pH 4.13), and with 5 percent of corn meal. Alfalfa ensiled alone developed a high butyric acid and low lactic acid content and was unfit for feeding, while the addition of corn meal gave very similar results. The addition of 2 percent molasses greatly reduced and 3 percent molasses completely prevented butyric acid development, while the lactic acid content was greatly increased, resulting in a desirable silage. The addition of mineral acid gave the most satisfactory results, but the local price of the acid made the cost prohibitive for practical use.

The preservation of silage, W. D. Reid (*New Zeal. Jour. Agr., 51 (1935), No. 3, pp. 139–143*).—Using small experimental silo units, the New Zealand Plant Research Station has investigated the effect on the resulting silage of adding a number of preserving agents, including lactic acid cultures, whey, molasses, and hydrochloric acid, to a number of crops ensiled at various stages of maturity.

In practically every case the treated lot of silage was of superior quality to the untreated control lot. The addition of lactic acid cultures or whey with molasses gave excellent results and is recommended as the most practical treatment, but molasses alone gave satisfactory results. The addition of hydrochloric acid produced a good product provided that air was entirely excluded, but the cost under local conditions was considered prohibitive.

Paths of excretion and mineral balance in animals drinking saline and alkaline waters, V. G. Heller and M. Haddad (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 439–447*).—Continuing this series of investigations (E. S. R., 75, p. 237), the degree of retention and paths of excretion of certain mineral elements ingested in the drinking water have been determined. Only data obtained on rats are herein reported, although cattle, hogs, and guinea pigs have also been included in the course of the study.

Approximately 90 percent of the chlorides is excreted in the urine, though fecal chlorides increased when acid-producing ions accompanied the intake of the chlorides. Greatest chlorine retention resulted from ingestion of calcium chloride. Sulfur excretion is usually about equally divided between the urine and feces. Increasing the sulfur intake increased its retention and also its presence in the urine. The degree of calcium retention tends to follow the rate of intake, with most favorable storage resulting from ingestion of calcium chloride. The content in the urine was comparatively low, the feces carrying away the greater portion of the excess. Magnesium absorption tends to parallel the calcium reaction, though a higher percentage of the excreted portion was found in the urine. A large percentage of phosphorus is excreted in the feces,

especially in the presence of large amounts of either calcium or magnesium. Increasing the phosphate intake causes a sudden increase of retention and also the percentage excreted in the urine.

The influence of the plane of nutrition on the manner of heat disposal by cattle, M. KRISS (*Amer. Jour. Physiol., 116 (1936), No. 2, pp. 262–273, figs. 4*).—In trials conducted by the Pennsylvania Experiment Station it is shown that the percentage of heat lost by vaporization of water, the total therms of metabolizable energy ingested, and the amount of water consumed follow strikingly parallel courses. In practically all cases, any change in the metabolizable energy intake was followed by a change in the percentage of vapor heat loss in the same direction.

It is concluded that the assumption that individual animals eliminate the same proportion of heat by water vaporization regardless of the plane of nutrition is not justified.

Fattening good, medium, and common grade steers, F. L. BENTLEY and P. T. ZIEGLER (*Pennsylvania Sta. Bul. 329 (1936), pp. 12, figs. 7*).—In order to determine the grade of feeder steers that would be most profitable under market conditions, three lots of good, medium, and common steers, respectively, were fed in each of 4 yr. All of the lots received the same ration hand-fed according to appetite. The ration consisted of corn-and-cob meal, a protein supplement, corn silage, and mixed hay. In the first two trials the supplement was equal parts of cottonseed meal and linseed meal, in the third trial cottonseed meal, and in the fourth trial pea-sized cottonseed. The feeding period was 168 days in each test.

The average cost of 100 lb. of gain for all trials was $8 for the good grade, $7.70 for the medium, and $7.68 for the common. The average return was $1.26, $1.39, and $1.27 for each 100 lb. of corn-and-cob meal fed for the respective grades, while the average net return per steer was $10.32, $13.73, and $10.98. The hogs following the steers were able to make an average of 15 lb. of pork per steer, and each steer was credited with producing 3 tons of manure.

Although in these trials the medium and common grades were more profitable than the good grade, the good grade steers used sold to the feeder at an average premium of 62 ct. and $1.03 per hundredweight over the medium and common steers, and since it cost practically as much to produce the poor grades of cattle as the better grade, it is estimated that if the feeder had raised his own stock, the good grades would have had a gross income of 1.5 and 8.25 percent greater than the medium and common grades, respectively.

The influence of various factors upon the growth and quality of fine wool as obtained from Merino sheep, D. S. BELL, D. A. SPENCER, and J. I. HARDY (*Ohio Sta. Bul. 571 (1936), pp. 57, figs. 15*).—The stated objects of this extensive investigation, conducted jointly by the station and the U. S. D. A. Bureau of Animal Industry, were to determine the seasonal rate of linear growth of fine wool produced by Merino sheep under a good system of feeding and management; the influence of sex, pregnancy, yeaning, breed, age, and seasonal condition of the feed supply on the rate of growth of fine wool fibers of such sheep; and the influence which various factors exert on the growth and quality of wool, through a comparison of the fleece production by American and Tasmanian Merino sheep kept under similar conditions of feeding and management and under climatic conditions prevailing in Ohio.

Under continuous good feeding and management it is indicated that the stage of wool growth had no noticeable effect on the rate of wool growth. Neither did sex, age, nor pregnancy appear to influence the rate of wool growth. However, wool growth during any period of the year is subject to acceleration

or diminution due to outside influences such as seasonal condition of the feed supply, the process of yeaning, or inception of lactation.

The Tasmanian Merinos consistently produced wool of greater fiber length than did the American Merinos; also response to outside influence causing accelerated or diminished wool growth was more pronounced among the former. Averaging the results from the female offspring of the respective breeds, the American Merinos and the Tasmanian Merinos produced an average of 16.19 and 13.73 lb. of grease wool and 5.99 and 7.18 lb. of scoured wool, respectively, per 100 lb. of live weight. The two lots of wool averaged 10.34 and 11.24 percent moisture, 28.08 and 14.79 grease, 24.77 and 21.34 dirt, and 37.03 and 52.33 percent clean wool, respectively. On this basis, the Tasmanian breed produced 16.89 lb. more clean wool per 100 lb. of wool sheared than the American breed, thus indicating the fallacy of using the yield of unscoured wool as a measure of a sheep's wool-producing efficiency. The fleece of the American flock contained on the average 47.2 percent more grease and also 39.6 percent more adhering dirt, apparently because grease supplied the adhering medium for the dirt. The high grease content did not afford exceptional protection against weathering, this factor apparently being more closely associated with length and density of the fleece than with grease content.

The two groups of sheep were judged to produce fleeces of about equal density, yet laboratory tests showed that the Tasmanian breed possessed from 8,000 to 20,000 more wool fibers per square inch of skin area than the American sheep. Density of wool fibers ranged from 45,821 fibers per square inch in a Tasmanian ewe to 11,834 fibers per square inch in an American ewe. Age also affects density of fiber, 7-year-old ewes producing only from 66 to 68 percent as many fibers as when they were 2-year-olds. Neither abundant wool oil production nor wrinkling were found to contribute to density of wool fiber. A study of cross sectional diameter and uniformity of adjacent wool fibers showed marked variation in diameter of wool fiber produced on different parts of the body and also showed that in adjacent fibers one may be three times the diameter of the other. Extreme wrinkling was adjudged detrimental to fiber uniformity throughout the fleece.

The American Merinos proved superior to the Tasmanian Merinos in all phases of meat production. The authors stress the possibility of improving the fleece of American Merinos by selecting breeding stock for less grease, fewer wrinkles, greater length of staple, more uniformity of fineness of fiber, greater density of wool per square inch of skin area, and greater weight of clean wool per 100 lb. of body weight.

The influence of pregnancy and lactation on Merino wool production, V. Bosman (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 4 (1935), No. 2, pp. 551–556*).—The average measured thickness of wool fiber of a group of Merino ewes during pregnancy and lactation and of the upper growth and lower growth of dry ewes was 20.19, 18.86, 20.29, and 20.97μ, respectively. It is concluded that pregnancy does not affect the wool fineness but that during lactation wool of finer quality number is produced. It is further suggested that change in the fineness of wool fiber due to lactation should be considered where fleece characteristics are studied from a genetic standpoint.

Studies of growth in swine.—II, Energy metabolism in swine [trans. title], K. Breirem (*Beret. Forsøgslab. K. Vet. og Landbohøjskoles [Denmark], 162 (1935), pp. VII+[1]+269, figs. 16; Eng. abs., pp. 192–200*).—This study has as its object the determination of the energy requirements for maintenance, growth, and fattening in swine and also the gain in energy in young growing pigs. Fifty-six metabolism and 155 respiration experiments were conducted. A

detailed account of these trials along with the composition and digestibility of all feeds involved is presented in tabular form.

The results indicate that (1) the digestibility of the most important nutrients as calculated for ruminants (Kellner's digestion coefficients) corresponds rather closely to that found for swine, (2) the amount of metabolizable energy for swine is from 10 to 15 percent higher than for cattle, due to less methane fermentation in swine, and (3) the net energy value of feeds is 30 percent greater for fattening swine than for fattening cattle, 45 percent greater for maintenance of swine than for fattening cattle, and 25 percent greater for growth and fattening of swine than for fattening cattle.

Formulas for calculating the energy requirements for maintenance and production in swine and also graphs indicating the gain in energy at various stages of growth are presented.

The net energy requirement of bacon pigs (maintenance and production) ranging from 15 to 90 kg live weight, and the effect of certain factors [trans. title], H. Edin and T. Helleday (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 449* (*1935*), *pp. 92+[2], figs. 9; Eng. abs., pp. 88–91*).—Combining the results of certain American, German, and Russian tests with extensive feeding trials conducted in Sweden, formulas are presented for calculating the normal growth rate of bacon pigs between 15 and 90 kg live weight and the net energy requirements, expressed as food units, for maintenance and production at various stages of growth. On the basis of these data, an attempt has been made to determine the effect of certain factors as season, type of housing, and level of feed intake on the metabolism of the animals.

The influence of previous feeding on the nitrogen excretion of fasting birds, J. C. Fritz, W. A. Hendricks, and H. W. Titus (*Amer. Jour. Physiol., 115* (*1936*), *No. 2, pp. 281–286, fig. 1*).—In this investigation at the U. S. D. A. Beltsville Research Center the daily rate of nitrogen excretion was determined for five groups of birds, each receiving a different source or level of protein feed over a 5-day feeding period, an 8-day fasting period, and an additional 5-day feeding period. The nitrogen excretion of birds on a previously high protein level showed a steady decline during the first 3 days of fast, while those previously on a low protein level declined the first day with an increase on the third day of fast. Three days of fasting freed the body of all stored nitrogen, the level and rate of excretion being very similar for all groups from the third to the eighth days of fast with neither the source nor level of previous feeding having any pronounced influence on the quantity of nitrogen excreted.

A factor in the milk fattening ration: The milk absorbing efficiency of certain grains and rations used for crate fattening poultry, L. Payne and F. Santo (*Amer. Creamery and Poultry Prod. Rev., 81* (*1936*), *No. 22, pp. 806, 816, fig. 1*).—This study at the Kansas Experiment Station gives information on the milk-absorbing capacity of eight single ground grains and two ground grain mixtures. When allowed to soak in milk at room temperature for 24 hr. the quantity of milk absorbed ranged from 21.1 gal. per 100 lb. of ground milo to 67.1 gal. per 100 lb. of ground whole oats, all others falling within a range of 30 to 45 gal. There was no apparent relation between the moisture content of the grain and the amount of milk it would absorb.

Feeding experiments with oats as grain for hens [trans. title], H. Bünger (*Arch. Geflügelk., 9* (*1935*), *No. 5–6, pp. 137–149; Eng. abs., pp. 148, 149*).—Feeding experiments over a 6-mo. period were conducted at five different experimental stations to determine whether oats could replace wheat in the ration for laying hens. The oats were readily consumed, and when fed exclusively the hens ate an average of 62 g daily. The consumption of mixed feed was not

decreased due to the presence of oats in the ration, and no ill effects resulted from the higher crude fiber intake. There was no reduction in egg production or in size of eggs, and body weight was equally well maintained on the oat diet. Approximately four parts of wheat can be replaced by five parts of oats without lowering the value of the ration.

Observations on the mineral metabolism of pullets, II, R. H. COMMON (*Jour. Agr. Sci.* [*England*], *26* (*1936*), *No. 1, pp. 85–100, figs. 4*).—Continuing this series of studies (E. S. R., 72, p. 678), four White Wyandotte pullets approaching laying age were used in a series of daily nitrogen, calcium, and phosphorus balance trials lasting for approximately 70 days and including the early laying period. Two pullets received a high calcium (3.1 percent) and the other two a low calcium (0.365 percent) ration.

The onset of egg production was not accompanied by a heavy phosphorus excretion in the case of high calcium carbonate intake. On the low calcium ration egg production was accompanied by high phosphorus excretion with a simultaneous increase in excretion of ammonia nitrogen, indicating the occurrence of ammonium phosphate excretion in the urine.

Eggs produced on the high calcium diet were higher in phosphoric acid than those on the low calcium diet. The calcium oxide: phosphoric acid retention ratio varied widely with the different levels of calcium intake, indicating calcium storage in forms other than the tricalcium phosphate. Evidence is presented to show that current feeding standards provide an excess of digestible protein over that required for egg production.

Is oystershell better than mussel shell for laying hens? [trans. title], R. FANGAUF and O. BRÜNINGHAUS (*Arch. Geflügelk.*, *9* (*1935*), *No. 5–6, pp. 180–184; Eng. abs., p. 184*).—In experiments with two groups of Leghorn hens, one of which received oystershell and the other mussel shell, it was noted that total feed consumption was greater and more and heavier eggs were produced by the group receiving the latter supplement. There are apparently no advantages in using oystershell instead of the more common mussel shell.

The relation of production to mortality in the domestic fowl, S. S. MUNRO (*Jour. Agr. Sci.* [*England*], *26* (*1936*), *No. 1, pp. 101–113*).—The Central Experimental Farm, Ottawa, has made a sutdy of the relation between egg production and rate of mortality as determined from 560 Leghorn and 710 Barred Rock hens entered in the Canadian egg-laying contest during a 51-week period.

In both breeds studied the birds that died were on the average poorer layers than those that survived, with statistical evidence that the rate of production and rate of mortality are entirely independent. It is suggested that practices tending to increase production have in a measure also contributed toward health and lowered mortality.

A nutritional deficiency causing gizzard erosions in chicks, H. J. ALMQUIST and E. L. R. STOKSTAD (*Nature* [*London*], *137* (*1936*), *No. 3466, pp. 581, 582*).—The California Experiment Station has demonstrated that gizzard erosion, which is commonly observed in chicks receiving usual practical diets and even in embryos in late stages of incubation and in day-old chicks, is a deficiency disease which may be corrected by a new fat-soluble factor. The saponifiable fraction of a hexane extract of dried kale or dried alfalfa was found to be an effective source of this factor. It is further shown that this disease is not associated with the hemorrhagic disease, copious amounts of known vitamins containing the antihemorrhagic factor proving ineffective in preventing gizzard erosion.

The causes of deterioration in market value of eggs, L. F. PAYNE and O. E. CAMPBELL (*U. S. Egg and Poultry Mag.*, *42* (*1936*), *No. 4, pp. 230–232,*

figs. 3).—The Kansas Experiment Station has compared the relative efficiency of a dirt-covered concrete cellar with a moist sand floor and an above-ground frame building for holding market eggs. The average July (1935) temperature for the cellar, the building, and outdoors was 68.6°, 87.1°, and 86.6° F., respectively, and the average humidity was 86.8, 49.2, and 45.2 percent, respectively. The decline in market value of the lots of eggs stored in each structure for 1 week and then subjected to various shipping conditions averaged 38 ct. per case for the cellar-stored eggs and $1.16 per case for eggs stored in an ordinary building. Remarkably constant temperatures were maintained in the cellar regardless of fluctuations in outside temperature.

Capon production, L. F. Payne (*Kansas Sta. Bul. 274 (1936), pp. 35, figs. 18*).—In this bulletin the author discusses the purpose of caponizing, characteristics of capons, breeds, age and size to caponize, identification of sex, the caponizing operation, rations for and cost of producing and marketing capons, and turkey and guinea capons.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Arizona] (*Arizona Sta. Rpt. 1935, pp. 49, 50, 51, 52*).—Results are reported from a comparison of the feeding value of alfalfa hay grown on phosphorus-treated ground v. hay grown on untreated ground.

Tests with dairy products produced results on canning milk on the farm, physiological varieties of bacteria in milk at the time of reduction in the methylene blue reduction test, and sweet buttermilk powder v. skim milk powder for ice cream.

[Dairy cattle investigations in Tennessee] (*Tennessee Sta. Rpt. 1935, pp. 22, 45, 46*).—Experiments at the West Tennessee Substation yielded results on the amount of grazing furnished by all-year pasture, and on the value of adding grain to a ration composed of all-year pasture, alfalfa hay, and silage, both by B. P. Hazlewood, while at the Middle Tennessee Substation a comparison was made of full v. limited grain feeding for dairy cows, by M. Jacob.

The influence of environmental temperature on the respiratory rhythm of dairy cattle in the Tropics, A. O. Rhoad (*Jour. Agr. Sci. [England], 26 (1936), No. 1, pp. 36–44, fig. 1*).—A study was made at Escola Superior de Agricultura e Veterinaria do Estado de Minas Garaes, Brazil, to determine the effect of environmental temperature on the respiratory rate of purebred Holstein, crossbred Holstein-Zebu, and Zebu cattle.

The average respirations per minute for these three groups, respectively, were 44.4, 29.8, and 27 at 23° C. (73.4° F.), 92.4, 74, and 34.5 at 29°, and 107, 89.3, and 46 at 36°. It appeared that at 36° the purebred Holsteins had reached their maximum effort of physical temperature regulation through the lungs.

These results indicate a difference among species in the response to tropical temperatures. It is believed that the loss of energy due to high temperature largely accounts for the comparatively low production records of the European cattle in the Tropics.

A study of progress of lactation in relation to the milk yield and the butterfat percentage of milk produced by cows of Shorthorn type, C. D. Oxley (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 113–120, figs. 2*).—Based on an analysis of the milk production and butterfat tests of approximately 500 Milking Shorthorn cows over five consecutive test periods, it is shown that maximum milk yield is reached approximately 30 days after calving, while the time of minimum test is attained somewhat later. The milk production was

greater, the butterfat content lower, and the total butterfat production slightly greater for the morning milkings. The coefficients of correlation between milk production and butterfat test were —0.154±0.019 for the afternoon milkings and —0.151±0.019 for the morning milking.

The influence of milking machines on milk yield, S. BARTLETT and S. L. HUTHNANCE (*Agr. Prog.* [*Agr. Ed. Assoc., Gt. Brit.*], *12* (*1935*), *pp. 144–147*).—In a study at the National Institute for Research in Dairying, 84 paired lactation records made either on hand or machine milking were compared.

The hand-milked cows averaged 6 days longer in lactation, produced about 50 gal. more milk per lactation, and were definitely more persistent in milk production beyond the fifth week of lactation than the machine-milked group. No significant differences in composition of milk produced by the two groups were noted.

The use of tribasic sodium phosphate in cleaning dairy equipment, L. A. ROGERS and F. C. EVANS (*Jour. Bact.*, *31* (*1936*), *No. 1*, *pp. 87, 88*).—This study by the U. S. D. A. Bureau of Dairy Industry indicates that a 5-percent solution of tribasic sodium phosphate is an excellent detergent and also possesses distinct bactericidal action. The addition of 3 percent of sodium chromate to the phosphate crystals will practically eliminate corrosive action.

Corn gluten feeding and the titratable acidity of milk, E. O. ANDERSON, G. C. WHITE, and R. E. JOHNSON (*Jour. Dairy Sci.*, *19* (*1936*), *No. 5*, *pp. 317–321*).—The [Connecticut] Storrs Experiment Station, in comparing the titratable acidity of fresh milk from different groups of cows whose grain ration varied from one containing no corn gluten feed to one containing 70 percent of gluten feed by weight, concluded that the titratable acidity of milk is not influenced by the presence of this product in the ration.

Effect of tankage on the flavor of milk, T. M. OLSON, C. C. TOTMAN, and G. C. WALLIS (*Jour. Dairy Sci.*, *19* (*1936*), *No. 5*, *pp. 313–315*).—Tests at the South Dakota Experiment Station indicate that the feeding of tankage to milking cows in varying amounts up to 50 percent of the grain ration had no noticeable effect on the flavor of milk, even when fed a short time prior to milking. It is noted that many cows refused their feed when it contained even small amounts of tankage.

Preliminary observations on certain seasonal variations in the physical properties and nutritive value of cow's milk serum, F. E. STIRN, C. A. ELVEHJEM, and E. B. HART (*Jour. Dairy Sci.*, *18* (*1935*), *No. 5*, *pp. 333–336*, *fig. 1*).—Experiments at the Wisconsin Experiment Station have shown that milk produced during the months following the removal of the herd from pasture undergoes some physical change which distinguishes it from summer-produced milk. It was impossible to obtain the typical clear yellow fluorescent solution on precipitation of the albumin, and the phosphorus was more difficult to precipitate in the winter samples. The change from green to dried plant material in the dairy ration is evidently closely associated with this condition.

Rat feeding tests demonstrated that the winter-produced milk was definitely lower in nutritive value, thus confirming earlier observations (E. S. R., 73, p. 377).

The effect of the adsorption "membrane" around the fat globules on the curd of cow's milk, L. S. PALMER and N. P. TARASSUK (*Jour. Dairy Sci.*, *19* (*1936*), *No. 5*, *pp. 323–335*).—This study at the Minnesota Experiment Station deals with the cause of the relatively low curd tension of natural buttermilk from sweet cream as compared with the higher curd tension of either the corresponding whole milk or skim milk.

The evidence presented indicates that this condition is brought about by the fat globule membrane complex released during the churning process, though

the exact cause of this reaction is unexplained. Neither the addition of pure phospholipides to milk nor the agitation of the whole milk at temperatures below that of churning were effective in reducing curd tension. Butterfat globules emulsified in skim milk did not adsorb any substance which affected the curd tension of milk plasma, but some complex was adsorbed by the butterfat from rennet whey which reduced curd tension. This is believed due to the protein component of the whey cream, and it is suggested that this may also be the case for the natural fat globule membrane.

Effects of time and temperature of holding milk heat-treated at various temperatures upon its subsequent coagulation by rennet, M. E. Powell (*Jour. Dairy Sci., 19 (1936), No. 5, pp. 305–311, figs. 3*).—In a study at the Minnesota Experiment Station it was shown that the heating of milk to 65° C. for 30 min. and immediate cooling to 35° did not retard its coagulation with rennet, while flash pasteurization at 75° with immediate cooling to 35° had only a slight retarding effect. The degree of retardation was progressively greater when milk was flashed at 85° or held for 30 min. at 75° and at 85°.

Aging milk for 3 hr. at 5°, 35°, or 65° after pasteurization at 65° for 30 min. had only a slight retarding effect, as is also true for milk flashed at 75° and aged at either 5° or 35°. Milk subjected to higher temperatures or to longer holding periods in pasteurization showed a progressive loss of coagulability as rennet addition was delayed, the effect being least when aging occurred at 35° and greatest when held at the pasteurizing temperature.

The phosphatase test for pasteurised milk, H. D. Kay and W. R. Graham, Jr. (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 191–203, fig. 1*).—The authors present a detailed description of two tests, one a rapid qualitative test and the other a quantitative test for determining the efficiency of milk pasteurization, both being based on the principle that proper pasteurization completely destroys the milk enzyme phosphatase. It is claimed that the rapid test will detect any gross errors of pasteurization technic, while the quantitative test will detect errors as small as 1.5° F. below minimum pasteurization temperature, holding at 145° for 20 min. instead of 30 min., or the addition of 0.25 percent of raw milk to properly pasteurized milk. The significance of these tests in relation to market milk control is discussed.

Detecting recontamination of pasteurized milk by bacteriological methods, W. H. Chilson, M. W. Yale, and R. Eglinton (*Jour. Dairy Sci., 19 (1936), No. 5, pp. 337–343*).—The New York State Experiment Station in a study of both raw and pasteurized milk samples collected from two plants, one using the flash-type and the other the holder-type pasteurizer, has found no colon organisms in properly pasteurized milk free from recontamination. Milk from one of the plants was frequently recontaminated before it was bottled. The most common sources of this recontamination are discussed.

Both standard agar plate counts and counts of colon organisms were made on all samples. While there was a general agreement between the two tests, in a few instances one of the tests conducted detected recontamination when the other did not, indicating that the latter test should supplement rather than replace the standard agar plate count.

Comparative fairness of single can and weigh vat samples of milk for bacterial counts as a basis for premium payments to grade A dairymen, M. W. Yale and R. S. Breed (*New York State Sta. Bul. 673 (1936), pp. 22*).—In this study a total of 1,297 milk samples from 227 farms was collected at three grade A milk plants in New York during 1934–35. Random can samples representing both night and morning milkings and weigh vat samples were taken in every case, and in addition composite can samples were taken for 138 farms.

In determining the variability of bacterial count in the different cans delivered by a single producer it is shown that in 52.4 percent of the farms studied all cans came entirely within a single premium class, i. e., a single can would have been entirely representative of the premium grade in only about one-half of the dairies studied. In comparing counts of individual cans with composite samples and with vat samples it is shown that can counts were higher in 39.8 and 42.2 percent and lower in 59.4 and 56.9 percent, respectively, indicating that the vat sample does not particularly favor either the producer or the milk company.

A comparison of the composite can counts and vat counts was made as a means of determining weigh vat contamination. Composite can samples were higher in 50.7 and lower in 47.1 percent of the cases. It is concluded that it is impossible to measure weigh vat contamination in this manner because errors in the agar plate method exceed differences due to such contamination. If no cans of milk with a bacterial count of milk exceeding 100,000 per cubic centimeter were received at a grade A plant, contamination from residual milk in the vat would almost never result in premium loss. Since weigh vat sampling is much more representative than a single can sample, and since no other practical method of taking composite samples is available, it is considered a desirable procedure.

Grading milk at the factory: A consideration of the value of the methylene blue reductase test and the fermentation test, S. B. Thomas and D. E. Ralph (*Welsh Jour. Agr., 11 (1935), pp. 209–224, figs. 2*).—The authors have made a study at three large milk plants and five dairy farms to determine the effectiveness of the methylene blue reduction test and the fermentation test in determining the sanitary quality of milk.

In comparing these tests with the presumptive test for coliform bacteria, it is concluded that the reduction test shows some correlation with the coliform test but that it cannot be considered reliable in determining the hygienic quality of milks, particularly those of low quality, and that there is little correlation between the coliform organism content of milk and the fermentation test.

The plate count of milk: Experimental errors in the examination of I, (a) different portions of the same sample by the same person, (b) different portions of the same sample by two different persons in one laboratory; and II, different portions of the same milk by ten persons in ten different laboratories, A. T. R. Mattick, J. McClemont, and J. O. Irwin (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 130–147*).—This study was undertaken to determine the variations in results of standard plate counts of the bacterial content of a single lot of milk as made on duplicate samples by the same worker, by two persons in the same laboratory, and by a number of different workers in different laboratories.

Based on a statistical analysis of data resulting from a large number of plate counts as described above, it is concluded that the differences in the results obtained by two well-trained workers in the same laboratory and using the same technic are no greater than those resulting from duplicate counts made by a single worker. However, results obtained by different workers in different laboratories on the same milk showed such wide variation that they were not comparable, probably due to different uncontrollable conditions encountered during transit.

The effect of the reaction (pH) of milk on the destruction of micro-organisms by heat, A. T. R. Mattick and A. A. Nichols (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 125–129*).—In a series of tests at the National Institute for Research in Dairying in which several samples of the same milk

were adjusted to various pH levels and subsequently pasteurized at 145° F. for 30 min., it is shown that as the pH of the sample is decreased the number of bacteria surviving also decreased. The relationship of these findings to certain plant practices is discussed.

The use of special litmus milk media for the diagnostic culture of lactic acid bacteria: (1) Dextrose litmus milk, (2) yeast extract litmus milk, and (3) yeast extract dextrose litmus milk, J. G. Davis (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 121–124*).—This contribution from the National Institute for Research in Dairying describes the preparation of three special litmus milk media and discusses their usefulness in determining the degree of acid production of various types of organisms.

Studies on Alcaligenes viscosus, H. F. Long and B. W. Hammer (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 261–265*).—Based on a detailed study at the Iowa Experiment Station of 36 cultures of bacteria considered as typical *A. viscosus*, a description of this organism, including special characters, morphology, cultural characters, biochemical features, and growth conditions, is presented.

During the course of the study 25 other cultures were isolated which were very similar to *A. viscosus* in every respect except for their lack of ability to produce ropiness. Apparently organisms of this type are commonly encountered among those isolated from dairy products. The designation *A. viscosus dissimilis* is suggested for them.

Observations on staphylococci associated with bovine mastitis, W. N. Plastridge, F. J. Weirether, and L. F. Williams (*Jour. Bact., 31 (1936), No. 1, pp. 88, 89*).—This report from the [Connecticut] Storrs Experiment Station indicates that milk samples yielding staphylococci rarely show evidence of mastitis unless accompanied by a leucocyte count of 300,000 or more cells per cubic centimeter.

The sequence of bacterial and chemical changes occurring in mastitis milk, L. A. Burkey, G. P. Sanders, and J. F. Cone (*Jour. Bact., 31 (1936), No. 1, p. 88*).—The results of this study by the U. S. D. A. Bureau of Dairy Industry show that a high leucocyte count and the presence of streptococci may occur for considerable time before physical or chemical changes occur in mastitis milk, and suggest that random bacteriological or chemical analysis of milk is of limited value unless the sequence of the change is well established.

The occurrence of coliform organisms in cream and their effect upon cream quality, E. G. Pont (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 148–153*).—In this study at the University of Sydney it was determined that of the gas-forming organisms isolated from 112 lots of cream 76.5 percent were typical *B[acterium] coli* and 11 percent *B. aerogenes*, while 12.5 percent are described as an intermediate type.

When samples of choice quality cream were inoculated with the various isolated strains and held at 25° C., it was noted that the *B. coli* group caused a slight lowering of quality after 8 hr., producing a stale, somewhat unclean flavor and aroma with no trace of ropiness and resulting in a deterioration to second grade cream in only 23 percent of the cases. The *B. aerogenes* and intermediate types had a more rapid and pronounced deteriorating effect, producing a strong "cowy" flavor frequently accompanied by ropiness and a lowering to second grade cream in 68 percent of the cases.

Factors affecting the properties and stability of whipping cream, C. W. England and C. M. Mecham (*Maryland Sta. Bul. 393 (1936), pp. 569–593, figs. 4*).—In this study of factors affecting the properties and stability of whipped cream experimental results were obtained on the time required for whipping,

percentage of overrun secured, and the total amount of drainage and the butterfat content of the drainage occurring during storage for the different lots of cream studied.

It required about 30 percent more time to whip Ayrshire cream than it did to whip Guernsey cream. The percentage overrun secured and the amount of drainage during 24 hours' storage was similar for the two lots, but the butterfat lost in the drainage was 1.76 times greater for Ayrshire cream. The difference in the results secured from the cream of these two groups is attributed to the smaller size of the fat globules in Ayrshire cream ($10.59\mu^3$) than those in Guernsey cream ($16.29\mu^3$). With samples of the same whipped cream stored at 40°, 52°, 60°, and 76° F. it is shown that there was little difference in the amount or fat content of the drainage of the two lower temperatures, while the amount lost was increasingly greater at 60° and at 76°. Moreover, most samples were slightly sour after 24 hours' storage at 76°.

In comparing a number of stabilizers which might be used to decrease the rate of drainage in whipped cream, sodium alginate and gelatin proved satisfactory, a concentration of from 0.2 to 0.25 percent of the former and 0.35 percent of the latter proving most desirable. Both stabilizers were very effective in reducing the amount of drainage but caused a pronounced decrease in the percentage of overrun secured. The type of whipper proved an important factor in obtaining the desired overrun, the Air Whip giving approximately twice as much overrun as was obtained with a turbine whipper in all samples compared.

It is concluded that the production of whipped cream for sale as such is entirely feasible and might advantageously be added to the list of dairy products offered for sale by the milk dealer.

The oxidation of acetylmethylcarbinol to diacetyl in butter cultures, M. B. Michaelian and B. W. Hammer (*Iowa Sta. Res. Bul. 205 (1936), pp. 201-214*).—Employing methods for the quantitative determination of diacetyl and acetylmethyl carbinol as previously described (E. S. R., 73, p. 232), the authors have studied the causative factors relating to the oxidation of acetylmethyl carbinol to diacetyl in butter cultures.

The addition of purified acetylmethyl carbinol to sterile skim milk and holding at suitable temperature did not result in the formation of diacetyl either in the presence of air or when carbon dioxide, hydrogen, nitrogen, or oxygen was bubbled through the milk. Inoculating the milk containing the carbinol with *Streptococcus lactis* did not result in any diacetyl formation during incubation. Again demonstrating the formation of diacetyl in acidified skim milk cultures of the citric acid-fermenting streptococci, it is shown that bubbling oxygen through the milk resulted in a higher yield while carbon dioxide, nitrogen, or hydrogen gave lower yields of diacetyl. In further studies with all the gases, acidifying the milk with a mixture of citric and sulfuric acid resulted in a higher yield of diacetyl as well as acetylmethyl carbinol plus diacetyl than resulted from acidifying with sulfuric acid alone. These various gases exerted the same general effect on the production of diacetyl in butter cultures as in pure cultures of the citric acid-fermenting streptococci, although the actual quantity produced was less in the butter cultures. Increasing the citric acid concentration in butter cultures when oxygen was bubbled through the milk increased the diacetyl production at a rate roughly proportional to the amount of citric acid added. The results indicate that the oxidation of acetylmethyl carbinol to diacetyl in a butter culture is due to the activity of the citric acid-fermenting streptococci and not to a direct chemical oxidation.

Studies on the mycological problems of dairying, I, II, T. R. Vernon (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 154-167, figs. 5; pp. 168-174,*

pl. 1, fig. 1).—These studies were carried on at the Imperial College of Science and Technology, London.

I. *The surface molding of butter*.—This study describes six types of surface discoloration commonly found on butter, with a list of the various fungi isolated and the effect exerted by each. Mold growth and subsequent discoloration rarely occurred when butter was held at storage temperatures of from 15° to 18° F. Under favorable temperature and humidity conditions butter itself will support mold growth, while the box wood and the parchment wrapper may be important sources of food supply. Well-washed parchment or parchment softened with salt will still support fungal growth, and glycerin-softened parchment is more liable to mold attack than glycerin-free paper.

II. *The internal and subsurface discolorations of butter*.—In studying subsurface discoloration of butter it was discovered that the organism *Cladosporium herbarum* was almost invariably responsible. Six strains of this organism were isolated, each producing a varying intensity of subsurface discoloration ranging from creamy to bluish green in color. Temperature is the controlling factor, none of the strains showing growth at 15° to 18°. Salt tends to restrict development of internal spotting.

Some observations on the methods of making clarified butter (ghee) with some notes on a new method, M. H. French (*Bul. Imp. Inst. [London], 34 (1936), No. 1, pp. 32–44*).—This article from Tanganyika Territory discusses old native methods of making clarified butter in comparison with improved methods. Results of tests show that an improved quality product may be prepared by shortening the cream-ripening interval, thorough washing, immediate clarification, and correct boiling of the butter.

A new method for preparation of this product from washed fresh cream rather than from butter is described which results in a product of better flavor, improved keeping quality, and higher vitamin A content.

Studies on the chemistry of Cheddar cheese making, I–III (*Jour. Dairy Res. [London], 6 (1935), No. 2, pp. 218–234, figs. 4; pp. 235–242, figs. 5; pp. 243–251, figs. 4*).—This is a series of three studies reported by the New Zealand Dairy Research Institute.

I. *The mineral content of cheese and whey*, F. H. McDowall and R. M. Dolby.—By determining the calcium and phosphorus content of whey it is shown that there is a constant rise in the concentration of both at each step in the manufacturing process up to salting, at which point there is a sudden temporary drop in the concentration of each, with calcium rising more rapidly and showing a more pronounced fall. Normally about 60 percent of the calcium and 57 percent of the phosphorus occurring in the milk is retained in the cheese. Increasing the acidity of milk before adding the rennet increases the mineral loss in the whey, particularly the calcium.

II. *The buffer capacity of wheys*, R. M. Dolby and F. H. McDowall.—Buffer values of whey were determined at each stage of the cheese-making process, covering a pH range of from 3.5 to 7.5. Comparing these with the buffer curves for various individual constituents of whey and for synthetic whey, it is concluded that in the pH range of 5 to 7.5 buffering is primarily due to calcium phosphate, while at a lower pH range of 3 to 5 it is chiefly due to the lactate. The form of the curve following salting of the curd is not explained by the addition of salt, since this is shown to have little effect on buffering. The presence of brine-soluble proteins is suggested as an explanation of this condition.

III. *The conversion of lactose into lactic acid by starter cultures*, F. H. McDowall and R. M. Dolby.—In a study of lactose fermentation following the

addition of various starter cultures to milk, a close parallel was found to exist between the destruction of lactose and the amount of lactic acid produced, with the increase of acidity of milk quantitatively accounted for by the amount of lactic acid formed. Even with commercial starters containing more than one strain of organism, the amount of byproducts produced from lactose over the whole fermentation was small.

The role of rennet in the ripening of Cheddar cheese, I. R. Sherwood (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 2*, *pp. 204–217*, *figs. 6*).—This study at the New Zealand Dairy Research Institute demonstrated that neither sterilization nor the addition of 1.6 percent of chloroform to the rennet significantly altered the type of proteolytic action of rennet in milk, although the chloroform reduced the activity of the rennet approximately one-half.

In further studies to determine the proteolytic action of rennet in Cheddar cheese, chloroform was introduced into the cheese about one week after manufacture in order to destroy all bacterial activity. Following the course of protein change during the subsequent storage period it was noted that proteolysis in the chloroformed cheese was identical with that occurring in the normal control cheese, indicating that rennet is the only important agent attacking cheese protein during the ripening period.

The function of pepsin and rennet in the ripening of Cheddar cheese, I. R. Sherwood (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 3*, *pp. 407–421*, *figs. 6*).—Continuing the above line of investigation, it is shown that the substitution of pepsin in place of rennet as a coagulant resulted in a lower degree of protein break-down, while the use of a mixture of pepsin and rennet gave results intermediate to those resulting from the use of either pepsin or rennet alone. Doubling the concentration of rennet produced a still greater degree of protein degradation. These results confirm the author's previous conclusion that the proteolytic enzymes in the milk coagulants are the primary agents causing protein break-down during the cheese-ripening process. Heat treatment of pepsin or rennet at a pH of 5 or 7.25 did not destroy the proteolytic enzymes.

Studies in Cheddar cheese.—IV, Observations on the lactic acid flora of Cheddar cheese made from clean milk, J. G. Davis (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 2*, *pp. 175–190*, *pl. 1*, *figs. 3*).—Continuing this series of studies (E. S. R., 72, p. 527), the author has made an extensive analysis of the lactic acid flora of Cheddar cheese from the time of manufacturing to 18 mo. in storage.

These flora are principally confined to four well-defined groups, namely, *Streptococcus lactis*, *S. cremoris*, *Streptobacterium plantarum*, and *S. casei*. The streptococci were found to predominate during the first month, with *Streptococcus lactis* predominating near the surface and *S. cremoris* largely occurring in the depth of the cheese. After 1 mo., the rod forms gradually predominated with *Streptobacterium plantarum* first appearing and being gradually replaced by *S. casei*, which was the sole survivor after 5 mo. in storage. Various factors controlling the sequence of the flora are discussed.

The salting and cooking of curds in the manufacture of several varieties of cheeses, J. C. Marquardt (*New York State Sta. Bul. 670* (*1936*), *pp. 16*, *figs. 2*).—This study deals with the effect of different rates and methods of salting and of different cooking temperatures on the flavor and texture of Cheddar, granular, Camosun, Monterey, and brick varieties of cheeses.

Salting lots of each variety of cheese at the rates of 1.5, 2.25, and 3 percent resulted in a corresponding average salt content in the cheese of 1.25, 1.63, and 2 percent. Little difference in body was noted, but salting at 3 percent caused a lowering of the flavor score. It is concluded that a salt content of 1.5 and

1.75 percent is preferable. In view of the difference in cheese yield for milks of varying fat content the desirability of salting cheese curds on a milk fat content basis is suggested, and a schedule of this type based on the present study is presented. Curd salting resulted in a higher score for both flavor and texture than brine salting and salt rubbing. The two latter methods gave similar results, and a combination of the two was satisfactory.

At cooking temperatures ranging from 96° to 108° F., the higher cooking temperatures were generally associated with a decrease of moisture and an improvement in quality of the cheese, cooking temperature causing less variation in Cheddar than in the other varieties studied. Comparable milks made into cheese produced quality cheeses on the basis of the variety made, with Cheddar first, followed in order by granular, Monterey, and brick, while quality and uniformity cannot be regularly expected when cheese is made by the Camosun method from the type of milk generally available.

Drum vs. spray process dry milk in ice cream, R. L. Carithers and W. B. Combs (*Ice Cream Rev., 19 (1936), No. 8, pp. 42, 60, 62, fig. 1*).—In studies at the University of Minnesota no differences could be detected in the flavor or in melting quality of ice creams containing either fresh drum-process or spray-process dried skim milk or plain condensed milk as a source of milk solids. However, after holding the dry milk samples in storage for 6 mo., the drum-process sample imparted a decidedly old stale flavor to ice cream and was decidedly inferior to the spray-process product at that time.

VETERINARY MEDICINE

[Report of work in veterinary medicine by the Arizona Station] (*Arizona Sta. Rpt. 1935, pp. 43–46, 50*).—Reference is made to the progress of an investigation of livestock losses and of infectious abortion in dairy cattle.

[Report of work in animal pathology and parasitology] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 39–42*).—The work of the year referred to (E. S. R., 73, p. 841) includes a study of paratyphoid bacilli, *Salmonella aertrycke*, animal parasites, and delayed conception and sterility in dairy heifers.

Poisonous and injurious plants of Colorado, L. W. Durrell and I. E. Newsom (*Colorado Sta. Bul. 429 (1936), pp. 75, figs. 89*).—Illustrated accounts are given of the important poisonous and other injurious plants occurring in Colorado that exact a toll from the livestock of the State often as high as 8 percent. Information is presented on mechanical injury by plants, cottonseed meal poisoning, prussic acid poisoning, selenium-bearing plants, weeds affecting flavor of milk, bighead or photosensitization, and cornstalk disease.

An important factor in the mechanism of specific bacterial agglutination, C. R. Donham and C. P. Fitch (*Jour. Infect. Diseases, 59 (1936), No. 1, pp. 6–10*).—The authors' experiments indicate that "the water included in the antigen preparation is inhibitory of agglutination. This adds one more complicating feature to the complex problem involving the measurement and control of the forces affecting the mechanism of agglutination. A practical method of recognizing this factor in the mechanism of agglutination and for overcoming its effect on agglutination results used in the diagnosis of disease is not available. . . . These studies suggest the need for experiments designed to find a more suitable suspending medium for bacterial agglutination antigens instead of being content with the time-honored saline solution."

Mechanical transmission of anaplasmosis by unclean instruments, G. W. Stiles, Jr. (*North Amer. Vet., 17 (1936), No. 6, pp. 39–41*).—The importance of mechanical transmission of anaplasmosis through the use of unclean surgical

instruments in operations for dehorning, vaccinations, drawing blood for serological tests, and intravenous injections is called to attention by the author. Experimentally, anaplasmosis has been transmitted by the intradermic injection of 0.025 cc of virulent blood.

The serologic classification of the Brucella group, L. Veazie and K. F. Meyer (*Jour. Infect. Diseases, 58 (1936), No. 3, pp. 280–287*).—Through the use of monospecific serums more than 400 strains of *Brucella* from 20 different countries have been classified by the authors.

"All the smooth cultures were easily separated into two main types, corresponding to the serologic '*abortus-suis*' and the '*melitensis*' types. A small subtype was observed, consisting of 26 strains, which is very similar to the *abortus* type in antigenic make-up. It is differentiated from the true *abortus* type by a greater proportion of *melitensis* antigen.

"A comparison of the serologic findings with those obtained by means of dye reactions and H_2S production revealed conflicting results in only 5.8 percent of the tests. All the cultures classified as '*suis*' type by biochemical reactions fall into the *abortus* type antigenically. Ten percent of the cultures identified as '*bovis*' type by dye reactions are serologically indistinguishable from *melitensis* cultures. Forty-two percent of these strains were isolated from a single herd of cattle in the United States. Their reaction indicates the value of systematic classification in epidemiological studies. It is suggested that certain investigators who have obtained unsatisfactory results from serological studies have encountered an undue proportion of such strains. Twelve percent of the cultures which are biochemically *melitensis* are serologically identical with the *abortus* type. All of these are old laboratory strains of unknown origin (Austria, Italy, Africa, and Tunis)."

A differential study of forty Brucella strains isolated in Minnesota, P. Kabler and M. MacLanahan (*Jour. Infect. Diseases, 58 (1936), No. 3, pp. 293–298*).—The authors have classified 40 Minnesota strains of *Brucella* as follows: "25 strains of *B. suis*, 13 strains of *B. abortus*, and 2 strains with conflicting reactions but 1 appeared to be *B. suis* and 1 *B. melitensis*. The agglutinin absorption method is of little or no value in the differentiation of *Brucella* strains in Minnesota. The original oxygen tension requirement, together with the dye plate growth characteristics, gave a fairly reliable means of differentiating the *Brucella* strains. The *Brucella* strains isolated in Minnesota from human cases of undulant fever indicated *B. suis* to be the etiological agent about twice as often as *B. abortus*."

Precipitin and complement-fixation reactions of polysaccharide extracts of Brucella, M. Higginbotham and L. S. Heathman (*Jour. Infect. Diseases, 59 (1936), No. 1, pp. 30–34*).—The results of the precipitin tests with the polysaccharide preparations from seven strains of *Brucella* indicate that organisms otherwise classified as of the same type may possess variable antigenic properties. The precipitin test is not a satisfactory one for establishing the type identity of a *Brucella* organism, although extracts from three of the seven strains were found to give a positive reaction with the homologous type antiserum only.

"The results support the contention that a polyvalent antigen including some local strains should be employed in the routine serological examination for undulant fever. All the serums from cases of human brucelliasis which showed agglutination with the stock antigens (*B. melitensis*, [*B.*] *abortus*, and [*B.*] *suis*) gave positive precipitin reactions with one or more of the *Brucella* polysaccharides. Although the series is small, the polysaccharide precipitin test would seem to have no advantage over the agglutination test as a routine pro-

cedure and has the disadvantage of being impracticable because of the time and cost involved in preparing extracts.

"The results of complement-fixation tests with the *Brucella* polysaccharide extracts and specific antiserums, as well as those with the extracts and patients' serums, were not as clear-cut as the precipitin reactions."

Development of immunity to fox encephalitis, R. G. GREEN (*Jour. Immunol., 29 (1935), No. 1, p. 73*).—It is shown that "serum of animals recovered from fox encephalitis contains antivirus and this can be increased by hyperimmunization. The maximum antivirus content is developed after more than 1 year's continuous injection of virus. The injection of serum-virus mixtures into normal foxes leads to death of the more susceptible animals after 30 days, when the serum has been eliminated. Development of acquired immunity to fox encephalitis seems to require several weeks for the most susceptible individuals. Recovery from fox encephalitis appears not to depend upon acquired immunity but upon the extent of natural immunity at the onset of the disease."

Favus (Achorion muris) infection of mice, M. D. COOK and R. GRAHAM (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 3, pp. 321–323, figs. 4*).—An account is given of a dermatitis of the scalp of mice at Urbana, Ill., due to *A. muris*, which primarily affects this host but is inoculable to man, producing an inflammatory ringworm of relatively short duration.

Neutralization tests with sera of convalescent or immunized animals and the viruses of swine and human influenza, T. FRANCIS, JR., and R. E. SHOPE (*Jour. Expt. Med., 63 (1936), No. 5, pp. 645–653*).—In the studies conducted, "human and swine influenza viruses were regularly neutralized by their homologous immune sera. However, the sera of animals convalescent from infection with either the swine or human influenza virus possessed little, if any, neutralizing capacity for the heterologous virus. Hyperimmunization of animals against swine influenza virus tended to increase the neutralizing capacity of their sera for human influenza virus but in an inconstant fashion, whereas repeated inoculations with human influenza virus frequently resulted in sera with strong neutralizing activities against swine influenza virus. These observations serve to emphasize both the immunological distinctiveness and the interrelationships of swine and human influenza viruses."

A note on the occurrence of Linguatula serrata (Froelich 1789) in Australia, E. MURRAY PULLAR (*Austral. Vet. Jour., 12 (1936), No. 2, pp. 61–64*).—This contribution includes a review of the presence and distribution of *L. serrata* in Australia, presented with a list of 21 references to the literature. Nymphs of *L. serrata* are commonly seen in the visceral lymph nodes of cattle, but adults appear to be extremely rare. A hypothesis that the parasite is propagated in Australia principally by fox-rabbit-fox passage is advanced.

A systematic study of the Pasteurella genus and certain closely related organisms, G. D. BRIGHAM and L. F. RETTGER (*Jour. Infect. Diseases, 56 (1935), No. 3, pp. 225–237*).—In a systematic study of a collection of strains that were all supposedly members of the *Pasteurella* genus, the morphological, cultural, and biochemical results showed that many had been placed in the wrong genus. "*Bact[erium] pestis* and *B. pseudotuberculosis rodentium* strains differ from true *Pasteurella* strains in not forming acid in sucrose and in not producing indole, and in their ability to grow on natural potato at 20° C. *B. pseudotuberculosis* differs from all of the other types in being motile, the motility being exhibited at 25° or below, and in rendering milk alkaline.

"A bacteriophage was not obtained from any of the *Pasteurella* cultures, and filtrable forms could not be demonstrated at any time."

The transmission of paralytic rabies in Trinidad by the vampire bat (Desmodus rotundus murinus Wagner, 1840), J. L. PAWAN (*Ann. Trop. Med. and Parasitol., 30 (1936), No. 1, pp. 101–130, pl. 1, figs. 2*).—The appearance of paralytic rabies among certain animals on the island of Trinidad in 1925 and its spread to human beings in 1929 led to the investigations herein reported. It is pointed out that human beings bitten by vampire bats developed sensory symptoms at the site bitten, followed by paralysis and death. It has been shown by histological examination, animal inoculation, cross-immunity, and serum neutralization tests that *D. rotundus murinus* was infected with the virus of rabies, and it is concluded that this bat is the transmitting agent of the disease, both in man and animals. A list of 56 references to the literature is included.

The serum protein changes induced by rinderpest virus, M. H. FRENCH (*Jour. Compar. Path. and Ther., 49 (1936), No. 2, pp. 118–140*).—Marked changes in the serum proteins of an ox have been found to take place during a fatal attack of rinderpest. "These changes are different from those which occur in animals making spontaneous recoveries from the disease and from those occurring during immunization of an ox by the simultaneous inoculation of virus and antiserum. The changes described have been shown to be produced by the virus and not by the experimental conditions, loss of appetite, nor the repeated bleedings. Antibody development is accompanied by an increase in the globulin content of the serum. The globulin increase is due most often to a large increase of the euglobulin fraction, though in some animals an increase of the proportions of pseudoglobulin also takes place. The serum proteins insoluble in saturated sodium chloride have been shown to be greater in amount than the euglobulin precipitated by 14 percent sodium sulfate. These proteins undergo a big increase during immunization, whilst the globulins soluble in saturated sodium chloride decrease as the insoluble fraction approaches its maximum value.

"A discussion is given of the probable distribution of the antibodies in the serum of immune animals."

Fermentative varieties of Salmonella aertrycke, P. R. EDWARDS (*Jour. Infect. Diseases, 58 (1936), No. 3, pp. 225–229*).—Work at the Kentucky Experiment Station has shown that cultures of *S. aertrycke* can be divided into groups by their reaction toward rhamnose, maltose, and xylose in the peptone-salt medium of L. Bitter, F. Weigmann, and H. Habs.[5] These groups coincide with the sources of the strains and apparently are of epizootic significance.

Oxidation-reduction potentials in Salmonella cultures.—I, The development of potential levels characteristic of species; II, Characteristic potentials produced by members of the suipestifer and enteritidis groups, W. BURROWS and E. O. JORDAN (*Jour. Infect. Diseases, 56 (1935), No. 3, pp. 255–263, figs. 4; 58 (1936), No. 3, pp. 259–262, figs. 2*).—Experiments in which the oxidation-reduction potentials produced in cultures of various species of the *Salmonella* group were measured are here described. Carefully authenticated strains of a single species produced potentials which varied only within narrow limits. Different species, however, produced potentials widely different from one another. A possible explanation is suggested.

Observations on enzootic paratyphoid infection in a rat colony, L. BUCHBINDER, L. HALL, S. L. WILENS, and C. A. SLANETZ (*Jour. Immunol., 29 (1935), No. 1, pp. 83, 84*).—A study was made of an enzootic in which 60 percent of the adults in a colony of rats were excreting a bacillus indistinguishable from

[5] München. Med. Wchnschr., 73 (1926), No 23, pp. 940, 941.

Salmonella enteritidis. In spite of this fact the general health of the colony as expressed by growth, regularity of the oestrous cycle, and fecundity was not notably different for 2 yr. previous to this study and 1 yr. since the infection was bred out. Continued studies revealed that many of these animals were chronic excreters of the paratyphoid bacillus. The longest period of observation for excretion was 10 mo., and the authors' data indicate that rats may be carriers for indefinite intervals of time. Suckling young of infected dams enjoy a relative immunity to *S. enteritidis* in spite of the fact that they suffer the most intimate type of contact with a constant source of infection; this is in contrast to their susceptibility in the postweaning period.

Staphylococcus food poisoning: Report of a small milk-borne epidemic, H. J. Shaughnessy and T. C. Grubb (*Jour. Infect. Diseases, 58 (1936), No. 3, pp. 318–323*).—The results of an investigation of an epidemic of food poisoning involving some 25 persons in which the consumption of raw milk from cows with a staphylococcus mastitis was found to be the cause of the poisoning are reported.

Studies on hemolytic streptococci.—II, Streptococcus pyogenes, A. C. Evans (*Jour. Bact., 31 (1936), No. 6, pp. 611–624*).—Reporting further upon hemolytic streptococci (E. S. R., 75, p. 540), *S. pyogenes* as here defined was found to be the hemolytic species of *Streptococcus* most commonly associated with human disease, causing the majority of cases of scarlet fever and erysipelas and almost half the cases of puerperal fever, although responsible for a comparatively small percentage of epidemics of septic sore throat. Reference is made to strains of *S. pyogenes* isolated from cows associated with epidemics.

The recoverability of Mycobacterium tuberculosis avium from experimentally infected guinea pigs, W. H. Feldman (*Jour. Infect. Diseases, 59 (1936), No. 1, pp. 1–5*).—In the work reported the recoverability of *M. tuberculosis avium* from experimentally infected guinea pigs was demonstrated. Thirty-four guinea pigs were inoculated subcutaneously with suspensions of a virulent organism. Necropsy was made from 1 to 70 days subsequent to injection and the spleens were emulsified and cultured. The avian tubercle bacillus was obtained from 8 of the 20 guinea pigs examined at necropsy up to and including 21 days after receiving the infective inoculum. Of the 14 animals examined at necropsy 28 to 70 days after the infection was introduced, 13 yielded the specific micro-organism. Macroscopic lesions of a tuberculous character were present in only 1 of the 43 animals examined.

These results have shown that the organism of avian tuberculosis may be recovered from the spleens of previously inoculated guinea pigs, although gross lesions of tuberculosis are usually absent. The findings suggest the advisability of culturing the spleens of guinea pigs routinely in the study of clinical material in which the presence of the avian tubercle bacillus is suspected.

The recovery of virulent tubercle bacilli from the tissues of swine intended for food, W. H. Feldman (*Jour. Infect. Diseases, 59 (1936), No. 1, pp. 43–49*).—Attempts made to isolate and type tubercle bacilli that might be present in dressed carcasses of swine that had been retained on post-mortem inspection for tuberculosis are reported upon. "Material was obtained only from those carcasses in which the lesions of tuberculosis were slight or localized and which were 'passed for food' after the diseased tissues had been removed. The left precrural lymph node from each of 88 carcasses and the right internal iliac lymph node from each of 13 carcasses were obtained and cultures prepared. Of the total of 101 specimens, tubercle bacilli were obtained from 4. Studies of pathogenicity revealed ... -terium *tuberculosis avium*.

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"This study should emphasize anew the importance of the problem of avian tuberculosis, and should indicate that virulent tubercle bacilli may still be present in the carcasses of hogs even though all visible lesions of tuberculosis have been removed."

Effectiveness of hot hypochlorites of low alkalinity in destroying Mycobacterium tuberculosis, S. M. Costigan (*Jour. Bact., 32 (1936), No. 1, pp. 57–63*).—The author has found that "heating suspensions of *M. tuberculosis* (human strain) to 60° C. for 5 min. does not destroy the organism. The hypochlorite solution of low alkalinity, containing 50 parts available chlorine per million parts of water heated to 50°, destroys *M. tuberculosis* in 2.5 min.; heated to 55° it destroys it in 1 min.; and heated to 60° it destroys it in 0.5 min. The hypochlorite solution of low alkalinity, containing 200 parts available chlorine per million parts of water heated to 50°, destroys *M. tuberculosis* in 1 min.; heated to 55° and 60° it destroys it in 0.5 min."

The isolation of Brucella abortus from the blood-stream of cattle, C. P. Fitch, L. M. Bishop, and M. D. Kelly (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 696–698*).—Studies at the Minnesota Experiment Station here reported indicate that "a bacteremia is not common in cattle with long-standing Bang's disease, but may be easily detected in recently infected cattle; also that the acid citrate, the heated citrate, and the liquoide culture methods are efficient for detecting a bacteremia due to *B. abortus*."

Bovine contagious abortion: The use of guinea-pigs in immunisation studies, A. D. McEwen and R. S. Roberts (*Jour. Compar. Path. and Ther., 49 (1936), No. 2, pp. 98–117*).—Studies of the immunization of guinea pigs inoculated with living micro-organisms of a nonvirulent strain of *Brucella abortus* are reported.

It was found that this strain, though smooth and fully agglutinable, does not stimulate the production of agglutinins in high titer even when inoculated in very large amounts. This is attributed to the lack of invasiveness and the inability of the organisms to persist in the body of the inoculated animal and not to defective or deficient antigenic structure. Female guinea pigs when pregnant were found highly susceptible to a uterine infection with *B. abortus* death of the fetus or fetuses and abortion frequently occurring.

"Comparative tests of vaccine prepared from different subcultures of the nonpathogenic strain, which were separated by over 200 subcultivations in one instance and by more than 500 in the other, do not indicate any definite antigenic deterioration caused by repeated subcultivation alone. The nonvirulent strain after 'intermittent' passage through a series of 6 guinea pigs was still nonpathogenic, but there was some evidence that as a vaccine it was superior to the nonpassaged strain. The evidence is too limited to warrant any conclusion, but it indicates one direction in which further experiments should be directed. Although in the majority of experiments clear-cut results were obtained, this was not always the case. Why in a few instances vaccinated groups of guinea pigs showed little or no more resistance than the control animals is still obscure. The killed vaccines tested were unsatisfactory."

Bang's-disease control [by the Tennessee Station], M. Jacob (*Tennessee Sta. Rpt. 1935, p. 22*).—Brief reference is made to the progress of Bang's disease control in breeding herds at the Middle and West Tennessee Substations.

Studies on contagious pleuro-pneumonia of cattle, I–III (*Austral. Council Sci. and Indus. Res. Buls. 93 (1936), pp. VI+32, pls. 6, figs. 89; 97 (1936), pp. 88, figs. 23*).—In reporting studies of contagious pleuropneumonia of cattle, part 1 (Bul. 93), by A. W. Turner, presents the results of a study of the morphology and life cycles of the organism of pleuropneumonia contagiosa bovum (*Borrelo-*

mycoes peripneumoniae n. g.) by observation in the living state under darkground illumination (E. S. R., 74, p. 258). Part 2 (Bul. 97), by A. D. Campbell and A. W. Turner, describes a complement fixation reaction for the diagnosis of contagious bovine pleuropneumonia (pp. 11–52); part 2a, by H. R. Seddon, records observations on the diagnosis of bovine contagious pleuropneumonia by means of the complement fixation test of Campbell and Turner (pp. 53–62); part 2b, by H. E. Albiston, the value of the complement fixation test for pleuropneumonia (pp. 63, 64); and part 3, by A. D. Campbell, upon a cultural study of the distribution of the specific organism, *B. peripneumoniae*, throughout the body of animals naturally and artificially infected (pp. 65–88).

Studies on bovine mastitis, L. E. STARR, T. H. PRESCOTT, and J. HUFFMAN (*North Amer. Vet., 17 (1936), No. 6, pp. 35–38, 39*).—In studies at the Virginia Experiment Station it was found that "the blood of cattle affected with mastitis is sterile and does not act as a focal factor. The blood of cattle is evidently highly bacteriolytic and bacteria are rapidly destroyed, even though they may gain entrance to it.

"Factors as yet unknown govern the entrance of micro-organisms to the mammary gland and the consequent production of mastitis. Mastitis may result following one injection of the causative organism into the teat canal without previous sensitization. The sphinctor muscles act as a barrier against microorganisms under natural conditions. Conditions unknown at the present time may be factors in the occurrence of mastitis.

"Autogenous bacterins made from organisms present in a herd and responsible for mastitis are of no value."

Trypanosoma congolense infection in cattle: Treatment by Antimosan and Surfen "C", J. T. R. EVANS (*Jour. Compar. Path. and Ther., 49 (1936), No. 2, pp. 160–162*).—Treatment of a small number of animals by Antimosan and Surfen C indicated that "a full course of Antimosan treatment as recommended by the manufacturers offers great hope of a complete cure being effected. . . . A single dose of Surfen 'C' offers as high a hope of effecting a complete cure as does a full course of Antimosan treatment."

The toxicity of thallium sulfate for cattle, B. R. McCRORY and J. C. WARD (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 3, pp. 301–312, figs. 6*).—Experiments conducted by the Colorado Experiment Station and the U. S. D. A. Bureau of Biological Survey cooperatively demonstrate that "after 24 hr. of fasting some cattle will take lethal quantities of thallium (as the sulfate) poisoned oats. The lethal dose for cattle is approximately 25 mg of thallium per kilogram body weight. In our experiments cattle ingesting quantities of thallium from the lethal dose upward died in from 4 to 13 days. Symptoms of poisoning develop from 24 hr. to 3 days after the thallium is taken, depending upon the dose given. The most typical symptoms were inappetence, salivation, mucopurulent discharge from the nose, gastrointestinal paresis, frequent micturation, and incoordination of the posterior quarters."

Botulism of sheep in Western Australia: Nutritional experiments, I, E. J. UNDERWOOD and F. L. SHIER (*Austral. Jour. Expt. Biol. and Med. Sci., 14 (1936), No. 2, pp. 77–91*).—A brief account is given of the occurrence of botulism in sheep in Western Australia, together with a description of experiments carried out in the affected areas during the summers of 1933–34 and 1934–5.

The transmission of antitoxic immunity from the ewe, vaccinated against entero-toxaemia, to the lamb, D. T. OXER (*Austral. Vet. Jour., 12 (1936), No. 2, pp. 54–58*).—It is concluded from the work conducted, the details of which are given in tables, that "(1) the usual prophylactic vaccination of ewes against enterotoxemia is followed in most cases by a marked response as judged

by the antitoxic titer of the serum; (2) there is considerable variation in the response of different individuals; (3) samples taken from lambs at, or shortly after, birth and prior to sucking contained no demonstrable antitoxin; (4) the antitoxic immunity developed by the ewe is transmitted to the lamb via the colostrum; [and] (5) the antitoxic titer of the lamb's serum gradually falls, but even after 1 mo. an appreciable amount may still be present."

Fatal effect of heavy infestation with Cooperia curticei (Railliet 1893) in goats, G. Edgar (*Austral. Vet. Jour., 12 (1936), No. 2, pp. 58–61*).—A description is given of a mortality in Saanen goats that is attributed to gross infestation with *C. curticei*, one of the smaller trichostrongyles which is not uncommon in New South Wales. *C. curticei*, when occurring as a heavy infestation, is believed to be of definite pathogenic significance.

A note on the toxicity of nicotine sulphate for lambs, A. L. Rose (*Austral. Vet. Jour., 12 (1936), No. 2, pp. 64, 65*).—Remedial measures applied to any extent to lambs poisoned by nicotine sulfate are not deemed practical, although lambs given 0.5 pt. of milk improved and no further deaths occurred.

Controlling lungworms of swine, B. Schwartz (*U. S. Dept. Agr. Leaflet 118 (1936), pp. 5, figs. 6*).—A practical account is given of the lungworms of swine, which, when present in large numbers, cause general unthriftiness in pigs, resulting in considerable economic loss. It is pointed out that the only known control consists in proper sanitation, as by the use of clean, well-fenced temporary pastures having good drainage.

Malignant neoplasms of the eye in horses, J. F. Bullard (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 3, pp. 324–332, figs. 6*).—This report of six cases is contributed from the Indiana Experiment Station with the view to stimulating the use of surgery in cases of malignant neoplasms of the eye in horses.

Susceptibility of the "gopher" (Citellus richardsonii (Sabine)) to equine encephalomyelitis, J. T. Syverton and G. P. Berry (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 822–824*).—The authors present evidence of the susceptibility of the gopher or Richardson ground squirrel (*C. richardsonii*) to the western type of the equine encephalomyelitis virus. Twelve successive passages through gophers were effected by intranasal instillation of virus-brain tissue suspensions derived from the preceding passage. The virus was recovered following the final passage. Its pathogenicity for guinea pigs and its specificity were demonstrated. It is suggested that the gopher and other wild rodents may possibly act as reservoir hosts for the virus in nature.

An arthropod vector for equine encephalomyelitis, western strain, J. T. Syverton and G. P. Berry (*Science, 84 (1936), No. 2173, pp. 186, 187*).—Referring to the work noted above, preliminary observations are said to indicate that ticks of the genus *Dermacentor* may act as vectors.

Active immunization of guinea pigs with the virus of equine encephalomyelitis, II–IV, H. R. Cox and P. K. Olitsky (*Jour. Expt. Med., 63 (1936), No. 5, pp. 745–765; 64 (1936), No. 2, pp. 217–232*).—The following are contributed in continuation of earlier work (E. S. R., 75, p. 108).

II. *Immunization with formolized virus* (pp. 745–765).—It is concluded from a study by quantitative methods that "a resistance of high degree may be induced in guinea pigs and mice against experimental equine encephalomyelitis by means of formolized vaccines in which no active virus can be demonstrated. The induced resistance is not due to residual traces of active virus which might possibly have escaped detection in the formolized tissue preparations."

III. *Quantitative studies of serum antiviral bodies in animals immunized with active and inactive virus* (pp. 217–222).—The authors have found that "guinea pigs injected with amounts of active equine encephalomyelitis virus inadequate

to induce protection against an intracerebral test of 1,000 or more m[inimal] l[ethal] d[oses] of virus show no significant humoral antiviral bodies. The latter are, however, regularly present in immune animals, and are best demonstrated by adding serum to low multiples of infective doses of virus under optimal conditions of time and temperature (2.5 hr. at 37° C.). Guinea pigs immunized either with active or with inactive (formolized) virus reveal no distinctive differences in the antiviral body content of their sera."

IV. *Effect of immune serum on antigenicity of active and inactive virus* (pp. 223–232).—It was found that "in active equine encephalomyelitis virus and in the virus inactivated by formalin there is a sufficient amount of antigen, without necessity of multiplication in the body, to produce immunity in guinea pigs against >1,000 <10,000 intracerebral lethal doses of virus. The antigenic capacity of both materials can be blocked to the same extent by the action of an appropriate amount of hyperimmune serum. The bearing of these findings on the mechanism of immunity induced by virus inactivated by formalin is discussed."

The treatment of equine Trypanosoma congolense infections with Surfen C (Bayer), S. C. J. BENNETT (*Jour. Compar. Path. and Ther., 49 (1936), No. 2, pp. 151–159*).—The author has found it unsafe to administer Surfen C to horses intravenously. "While 'safe' in the usual chemotherapeutic sense to inject it subcutaneously, large swellings developing at the site of injection render this route objectionable. Intramuscular injection is less objectionable than subcutaneous, although even by this route, in spite of giving multiple small doses, or even of giving a series of doses at intervals of a week or 10 days, troublesome local swellings may develop. In no case in the recorded series of treatment did any toxic symptoms develop following intramuscular injection, indicating that horses can, apart from possible surgical complications, probably tolerate appreciably larger doses than were used in this series of observations.

"Surfen C is certainly capable of curing nearly all, if not all, cases of *T. congolense* in horses, and in this respect it is the best agent hitherto studied. Its only drawback—and it is a serious one when the necessity for routine mass treatment has to be contemplated—seems to be referable not so much to the drug as to the patient, namely, the extreme variability of individual response. Some horses are cured by a single dose of 1 g/100 kg, while others require much more. It is therefore unlikely that any orthodox course of treatment will be developed; each patient will call for close individual attention, even to the degree of confirming cure by small-animal subinoculation."

Notes concerning internal parasites of poultry in Puerto Rico, E. B. CRAM (*Puerto Rico Sta. Agr. Notes No. 70 (1936), pp. 5*).—This is a report on the results of an investigation conducted in Puerto Rico from October 7, 1935, to January 9, 1936, to determine the kinds of parasites present in poultry, the severity of parasitic infestations, their importance economically, the influence of environmental factors, and recommendations for control.

The vaccination of baby chicks against fowl pox, H. M. DEVOLT, I. M. MOULTHROP, and C. R. DAVIS (*Maryland Sta. Bul. 395 (1936), pp. 627–633, figs. 2*).—In experimental work in 1935 the vaccination of 73 12-day-old Single Comb White Leghorn chicks against fowl pox by the stick method resulted in a satisfactory performance during the first 2 weeks after vaccination. "During the next fortnight, however, there was some sickness as a result of systemic reactions which caused the death of 4 and a loss of body weight in others. The vaccinated group as a whole recovered and developed well during the remainder of their growing period, although their average body weight was slightly below that of the control group, reared under similar conditions. When tested for

immunity a little over 7 mo. after vaccination, only 8.33 percent of the males tested and 45.5 percent of the females were immune. The vaccination of these fowls at the age of 12 days, therefore, did not confer a uniform and complete immunity lasting to maturity in all cases."

Immunological studies with the virus of infectious laryngotracheitis of fowls using the developing egg technique, F. M. Burnet (*Jour. Expt. Med., 63 (1936), No. 5, pp. 685-701, pl. 1*).—In the work reported, the technic of chorioallantoic membrane inoculation (E. S. R., 72, p. 844) has been applied to the study of the virus of infectious laryngotracheitis as it occurs among Australian poultry.

The author found that "when suitably diluted suspensions of virus are inoculated, isolated foci or pocks appear whose macroscopic form and histological structure is characteristic. The numbers of these foci may be used as a measure of the amount of virus present.

"Two distinct types of focus are produced by laryngotracheitis strains, one being characteristic of epizootic strains from New South Wales and from America, the other of a Victorian strain which is of very low virulence for fowls. No qualitative antigenic differences can be detected among these strains, but the epizootic strains are more readily neutralized by immune serum than the enzootic Victorian strain.

"A study of the inactivation of the virus by immune serum shows that (1) the process of inactivation requires time for its completion in vitro; (2) the proportionate reduction in titer produced by a given concentration of antiserum is independent of the initial virus concentration; (3) reactivation by dilution is readily demonstrable; (4) virus in the presence of small concentrations of immune serum producing only a slight inactivating effect is rendered incapable of passing a gradocol membrane normally permeable to it; [and] (5) the foci produced from partially neutralized virus suspensions are smaller than normal, suggesting delay in the initiation of foci.

"These findings bring the neutralization of a typical virus by immune serum completely into line with the phage-antiphage reaction as described by [C. H.] Andrewes and [W. J.] Elford."[4]

A filterable virus, distinct from that of laryngotracheitis, the cause of a respiratory disease of chicks, J. R. Beach and O. W. Schalm (*Poultry Sci., 15 (1936), No. 3, pp. 199-206*).—A report of work in California, of which progress accounts have been noted (E. S. R., 69, p. 863; 71, p. 854; 73, p. 237; 74, pp. 107, 392).

The experiments conducted have shown "that nasal, tracheal, and bronchial exudate from two strains of a respiratory disease of chicks, which clinically resembles infectious laryngotracheitis, when suspended in bouillon and passed through Berkefeld V, N, or W filters will produce the disease. These results demonstrate the disease is caused by a filtrable virus which passes through all grades of Berkefeld filters."

Chickens that recovered from an infection with one of the two strains of virus were refractory to further infection with either strain. The sera from chickens that have recovered from an infection with one strain of the virus would neutralize virus of either strain. These results show the identity of the two strains of virus. Chickens that were refractory to infection with this virus were shown to be susceptible to coryza caused by *Hemophilus gallinarum* and to the virus of laryngotracheitis. "Likewise, chickens refractory to the latter virus were suspectible to the former. These results demonstrate that the two viruses are distinct from one another.

[4] Brit. Jour. Expt. Path., 14 (1933), No. 6, pp. 367–383, figs. 4.

"The virus dried by Swift's method and stored in a refrigerator for 180 days has produced disease. In 50 percent glycerin and stored in a refrigerator it has remained alive for 80 days."

The blood pH of leukotic fowls and the filterability of the leukosis agent, E. P. Johnson and W. B. Bell (*Jour. Infect. Diseases, 58 (1936), No. 3, pp. 342–348*).—In work at the Virginia Experiment Station, "the average blood pH of 50 normal fowls was found to be 7.56 and that of 35 leucotic fowls 7.57. This slight difference in blood pH is concluded to be insufficient for the identification of leucotic birds on this basis. Our filtration experiments give no support to the claims that leucosis is due to bacteria or to intestinal parasites. These results, on the other hand, demonstrate quite clearly that the causative agent of the various forms of leucosis is filtrable through membranes that retain *S[almonella] pullorum*, which has dimensions of 1,000 to 1,500 mμ. A separation of two or more filtrable agents, on the basis of particle size, as factors in the etiology of the various forms of leucosis was impossible with the filters used in these experiments.

"These results, therefore, are in accord with the view that a single filtrable agent is responsible for the various forms of the disease. From these results it may be concluded that the particle size of the leucosis agent lies between the limits of 400 and 100 mμ, or possibly less."

The transmission of fowl paralysis (lymphomatosis), E. M. Gildow, J. K. Williams, and C. E. Lampman (*Poultry Sci., 15 (1936), No. 3, pp. 244–248*).—Studies conducted by the Idaho Experiment Station are considered to have reasonably well established that "fowl paralysis is readily transmitted by pen contact from affected to nonaffected chicks. The disease develops to a less extent in chicks from an affected flock than in chicks from a nonaffected flock when brooded together. The disease is more prevalent in chicks from pullet-breeding stock than in those from hen-brooding stock from the same affected flock. Evidence of variation in inherited resistance is apparent in different families. No major variation in the incidence of the disease was shown between range-raised and confined-raised birds."

Sixteenth annual report on eradication of pullorum disease in Massachusetts, H. Van Roekel et al. (*Massachusetts Sta. Control Ser. Bul. 83 (1936), pp. 8*).—In control work during the year with pullorum disease (E. S. R., 74, p. 400), 252 flocks containing 329,659 fowls (344,081 samples) from 11 counties were blood tested. An average percentage of but 0.30 was positive, the lowest obtained during 16 yr. of testing. Of the total number of samples tested, 313,333 were from females and 30,748 from males, of which 0.31 and 0.17 percent, respectively, were positive. In 2 of the counties no reactors were found among the birds tested. The details are given in five tables.

The chicken as a carrier of the oocysts of the Coccidia, Eimeria tenella, C. A. Herrick, G. L. Ott, and C. E. Holmes (*Poultry Sci., 15 (1936), No. 4, pp. 322–325*).—In work conducted at the Wisconsin Experiment Station "15 chickens infected with cecal coccidiosis were autopsied at intervals up to and including 12 mo. following infection, and all but 2 harbored oocysts in the tissues of the cecal pouches. Viable oocysts were found to be passed in the cecal droppings and enmeshed in the tissues of the cecal pouches for a period of 7.5 mo. None of the controls was found to harbor oocysts, and since no infection resulted in susceptible chickens from the feeding of cultured cecal droppings and cecal scrapings it is believed that none of the infected animals kept in the same cages with the controls became reinfected."

The cysticercoid of the fowl tapeworm Raillietina cesticillus, J. E. Ackert and W. M. Reid (*Amer. Micros. Soc. Trans., 55 (1936), No. 1, pp. 97–100, figs. 2*).—In work at the Kansas Experiment Station, "gravid proglottids of the fowl tape-

worm *R.* (*Skrjabinia*) *cesticillus* (Molin) Fuhrm. fed to ground beetles (*Amara basillaris* Say) produced in 16 to 18 days numerous mature cysticercoids. The cysticercoids that evaginated in water showed the characteristic broad rostellum of *R. cesticillus*. The invaginated cysticercoids when fed to young chickens raised in confinement developed into adult *R. cesticillus* in 16 days. The control chickens were negative. Another species of beetle, *A. basillaris* Say, is added to the list of intermediate hosts of *R. cesticillus*, and description of the cysticercoid in this country is recorded."

Clostridium botulinum type C in relation to duck sickness in the Province of Alberta, R. M. Shaw and G. S. Simpson (*Jour. Bact., 32 (1936), No. 1, pp. 79–88*).—In the course of a study of a severe epidemic that occurred in 1933 among wild ducks feeding about Stobart and Namaka lakes, about 45 miles east of Calgary and 130 miles north of the Montana border, pure cultures of *C. botulinum* type C were isolated from the organs of a duck dead of duck sickness.

"Antitoxin produced against the toxin of this freshly isolated strain protected experimental birds against homologous toxin and against that of a known culture of *C. botulinum* type C. The use of this antitoxin in toxin-antitoxin protection experiments enabled us to demonstrate the presence of *C. botulinum* type C in the bodies of six other waterfowl and in cultures of mud from the epidemic area.

"Tables were prepared showing the neutralizing effect of the antitoxin on toxin from our pure culture strain and from a known strain of *C. botulinum* type C. Where it was possible to obtain heart's blood from the ducks at or shortly after death, an examination was made and large numbers of filarial worms were found. These were not regarded as having any significance in the epidemic."

The gizzard worm, Amidostomum anseris, of geese in western Washington: Reports of cases, A. C. Jerstad (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 3, pp. 318–320*).—The author has found the parasitic nematode *A. anseris* in geese from King and Pierce Counties in western Washington. In three of the cases reported, it is considered the primary lethal factor, and in one case it was found associated with other parasites. One case infested with *A. anseris*, in which eggs of *Capillaria* sp. were found in the droppings, was successfully treated with carbon tetrachloride.

A virus disease of owls, R. G. Green (*Jour. Immunol., 29 (1935), No. 1, pp. 68, 69*).—The author reports having experimentally transmitted a disease from a great horned owl (*Bubo virginianus*) found dead in the wild, as previously reported by Errington (E. S. R., 72, p. 699), to a second great horned owl and to a screech owl (*Otus asio*). Attempts to transmit the disease to a great gray owl (*Scotiaptex nebulosa*), pigeons, and guinea pigs met with failure.

"The liver and spleen of the owl dying of the natural infection were studded with fine abscesses. Microscopic examination of the organs showed the liver to contain many microscopic abscesses. In the peripheral zone of the abscesses were many intranuclear inclusion bodies involving principally hepatic cells and occasionally an endothelial cell. Similar inclusion bodies were found in the livers of both owls experimentally infected. The distinctive nature of the intranuclear inclusions leaves no doubt that the infection is to be classed as a virus disease."

A virus disease of owls, R. G. Green and J. E. Shillinger (*Amer. Jour. Path., 12 (1936), No. 3, pp. 405–410, pl. 1*).—This is a detailed account of the work above noted. A barred owl (*Strix varia varia*) injected with the original material is said to have remained well; the affection was transmitted to both the great horned owl (*Bubo virginianus*) and the screech owl (*Otus asio*).

Pullorum disease in turkeys, E. P. Johnson and G. W. Anderson (*Jour. Infect. Diseases, 58 (1936), No. 3, pp. 337–341*).—In this contribution from the Virginia Experiment Station the authors report upon two rather extensive outbreaks of disease among turkeys in which the death of a large number of poults was due to *Salmonella pullorum* infection. The significance of low titer agglutination reactions with serums from birds harboring nonpathogenic organisms is discussed, and it is concluded that a titer above 1:50 would be necessary to locate birds harboring *S. pullorum*.

Since two previous hatches of turkey eggs in the incubators used had resulted in no disease among the poults raised in these groups, the evidence points clearly to the transmission of *S. pullorum* through the eggs of the affected female in each group. The fact that nearly 100 percent mortality resulted in one flock does not discredit this view, as it is well known that a few affected individuals can easily spread the infection to a large number in a short time.

A transmissible tumor-like condition in rabbits, R. E. Shope (*Jour. Expt. Med., 56 (1932), No. 6, pp. 793–802, pls. 4*).—A tumorlike condition observed in the wild cottontail rabbit (*Sylvilagus* sp.) was found to be transmissible to both wild and domestic rabbits but not to guinea pigs, white rats, white mice, or chickens.

A filtrable virus causing a tumor-like condition in rabbits and its relationship to virus myxomatosum, R. E. Shope (*Jour. Expt. Med., 56 (1932), No. 6, pp. 803–822*).—A study of the nature of the etiological agent of the tumorlike condition in rabbits above noted has shown it to be a filtrable virus. While this tumorlike condition and infectious myxoma differ markedly in their clinical and pathological pictures, they have been found to be related immunologically.

Concerning the transmission of the fibroma virus (Shope) of rabbits, R. R. Hyde (*Amer. Jour. Hyg., 24 (1936), No. 1, pp. 217–226, figs. 4*).—The author has confirmed the finding of Shope (above noted) that the fibroma virus is not spread in the rabbit by contact, differing in this respect from that of infectious myxoma, to which it is closely related.

In experimental work the domestic rabbit in which the fibroma virus had been established in the upper respiratory tract failed to transmit the disease by contact, as was shown by susceptibility of the contact rabbits to the myxoma virus. This also held true when the fibroma virus was established by way of the skin or the eye. The domestic rabbit treated with the fibroma virus by way of the eye, nose, or skin was highly immune to the myxoma virus by all portals of entry.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the Arizona Station**] (*Arizona Sta. Rpt. 1935, pp. 19–24, 29, 30*).—The progress results are briefly presented of investigations on the State law with respect to ground water, evaporation rate and duty of water, problems of irrigation enterprises, irrigation water supply of the Safford Valley, and creosoting tamarisk for fence posts.

Pacific drainage, British Columbia and Yukon Territory, climatic year 1929–30, C. E. Webb (*Canada Dept. Int., Water Power and Hydrom. Bur., Water Resources Paper No. 67 (1935), pp. 316, pl. 1*).—This report presents the results of hydrometric investigations in the Province of British Columbia for the climatic year ended September 30, 1930.

Fluorine (*Arizona Sta. Rpt. 1935, pp. 16, 17*).—The report briefly notes a survey showing most of the waters of high fluorine content to be those of private wells northeast and southeast of Phoenix. The toxic water could be cased

out at 100 ft. in some of these wells, in others only at 300 ft. or at greater depths.

Experimental study of the scour of a sandy river bed by clear and by muddy water, C. A. Wright (*Jour. Res. Natl. Bur. Standards* [U. S.], *17* (*1936*), *No. 2, pp. 193–206, figs. 14*).—This paper reports the results of an experimental comparison of the scour produced in a bed of fine sand in a sloping flume by muddy water (water containing an appreciable amount of clay in suspension) and by clear water.

Critical velocities of the water were determined for incipient movement of the sand bed in the form of riffles and were found to be greater for muddy water than for clear water. With the muddy water an increase of about 10 percent in mean velocity was necessary to scour out the same amount of Colorado sand as was scoured by clear water under otherwise similar conditions. For coarser sands this increase was greater.

It is concluded that when clear water is discharged at the Boulder Dam it will cause greater scouring away of the sand bed than did the muddy water under previous conditions.

Silting of reservoirs, H. M. Eakin (*U. S. Dept. Agr., Tech. Bul. 524* (*1936*), *pp. 142, pls. 16, figs. 29*).—The purpose of this report is to present a preliminary outline of the more important aspects of reservoir silting and to summarize the results of studies made previously by other agencies, together with the findings of the Soil Conservation Service during the fiscal year ended June 30, 1935. Observations on representative reservoirs and other data show that silting of reservoirs is a practical problem of the first order of importance in the southeastern, southern Great Plains, and southwestern type areas of the United States wherever accelerated erosion is in force.

"In the Southeast, reservoir silting results chiefly from erosion of deep residual soils as influenced by human occupation. Lower rates obtain in mountainous and other sections wherever the natural forest cover is practically intact. Higher rates go with agricultural practices in the lower Piedmont country—practices that can be greatly improved upon from the standpoint of erosion. Organized cooperation of the agricultural population toward better terrace and crop practices and rededication of over-steep lands to noncultivated crops or forest is eminently in order. Also much benefit can come from structural and vegetational gully control.

"In the southern Great Plains higher rates of silting relate to erosion of sedimentary soils under agricultural and grazing practices. Greater attention to terrace and contour cultivation, cover and strip cropping, and control of incipient gullies can contribute material improvement. More restricted grazing and range restoration is needed in many places. Silt detention above reservoir level in broad tributary valleys in most reservoir watersheds also can be effectively and profitably employed.

"In the Southwest higher rates of silting are largely the result of overgrazing and its consequence of extraordinary sheet and gully erosion. Sheet erosion perhaps can benefit in time through further restriction of grazing beyond that already imposed by the sparseness of remaining grasses. Arroyo and gully production of sediment can be reduced or even prevented from increasing only by direct engineering methods. Silt detention above reservoir level in broad tributary valleys by earth barriers and by growth of vegetative screens in delta areas is highly practicable in many cases. It would also appear, in view of the indications of underflow and congregation against the dams in this region of muddy flood waters, that important reduction of rate of silting is

probably feasible through selective wastage of heaviest charge waters through low-placed outlet gates. . . .

"In broad national view it appears that exorbitant rates of depletion of reservoir storage by silting are widely prevalent, and that the problem of protection of reservoirs from this menace goes hand in hand with that of saving farm and range lands from impairment and destruction by uncontrolled erosion."

An appendix presents instructions for reservoir sedimentation surveys.

Soil conservation, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-MP-7, pp. 8*).—This is a brief popular statement describing the problem of soil conservation in the United States.

Soil erosion and its control in the United States, W. C. Lowdermilk (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-MP-3, pp. 12, fig. 1*).—The purpose of this paper, presented before the Third International Congress of Soil Science, is to comment in a broad way on the program of man-induced erosion and its control in the United States. The first part of the paper reviews the condition of the American Continent in early colonial days, and the second part describes the present condition of the land after three centuries of exploitation. The third part discusses methods of control which are being undertaken.

Soil defense in the South, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-MP-8, pp. 7*).—This is a brief popular comment on soil erosion control in the Southern States.

Man-made deserts, W. C. Lowdermilk (*Pacific Affairs, 8 (1935), No. 4, pp. 409-419; also U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-MP-4, pp. 8*).—This is a popular discussion of soil erosion conditions induced by human practices.

The role of the capillary potential in the dynamics of soil moisture, W. Gardner (*Jour. Agr. Res. [U. S.], 53 (1936), No. 1, pp. 57-60*).—A brief mathematical analysis is presented in continuation of work previously noted (E. S. R., 72, p. 700).

Subsidence of peat soils in Florida, B. S. Clayton (*U. S. Dept. Agr., Bur. Agr. Engin., 1936, pp. 15, figs. 5*).—The results of studies of subsidence of peat soils following drainage, conducted by the Bureau of Agricultural Engineering in cooperation with the Florida Experiment Station over a period of 20 yr., are summarized.

In the Everglades area the available data show the greatest depths of peat soil to be near Lake Okeechobee and a gradual decrease in this depth as the edge of the Everglades is approached. Some records along the east side of the lake show depths of from 12 to 14 ft. Most of the muck and peat soil now in cultivation around Lake Okeechobee is in pumping units in which the major subsidence has already taken place.

In the heavier muck soils, such as the "custard apple" belt adjacent to Lake Okeechobee, the subsidence appears to be less than that in the sawgrass peat farther out from the lake. This is due to the higher mineral content and greater density of the custard apple soil. Subsidence appears to be proportional to the depth of deposit above the permanent water table, or to the total depth where the water table is below the bottom of the deposit as in the Davie area.

Following drainage, the rate of subsidence decreases with time. The curve of subsidence apparently approaches a tangent parallel to the time axis, and it seems probable that if fires are prevented the rate of subsidence will be reduced to a very small amount. The small loss due to slow oxidation may be largely offset by the addition of the fibrous portion of plant roots. As subsid-

ence continues, the density of soil above the water table apparently increases. The available data appear to show that cultivation does not account for any considerable portion of the total subsidence.

The available data for deep peat deposits indicate total losses in elevation of 4 to 5 ft. in the first 20 yr. following original drainage, and it seems probable that an additional loss of as much as 1 ft. may occur in the next 10 yr. However, if adequate drainage had been maintained in the deep peat areas by deepening the drainage systems, the rate and amount of subsidence would probably have been greatly increased over actual figures obtained. If the depth of soil underlain with rock becomes less than 2.5 to 3 ft., successful cultivation will be difficult on account of the limitation in depth of farm ditches.

Public Roads, [August 1936] (*U. S. Dept. Agr., Public Roads, 17 (1936), No. 6, pp. 113–142+[1], figs. 13*).—This number of this periodical contains data on (1) the status of the various highway projects receiving Federal funds as of July 31, 1936, (2) State motor-fuel consumption and tax receipts, 1935, and (3) State motor-vehicle registrations and receipts, 1935, and the following articles: Digest of Report on Arkansas Traffic Survey, by L. E. Peabody (pp. 113–127); and The Cone Method for Determining Absorption by Sand, by D. O. Woolf (pp. 128–134).

Weights of South African grown timbers, M. H. Scott (*Union So. Africa Dept. Agr. and Forestry Bul. 145 (1935), pp. 21, figs. 4*).—This is a practical type of publication which brings up to date data on the air-dry weights of South African timbers of economic importance.

The laboratory testing of lubricants, F. J. Slee (*Jour. Soc. Chem. Indus., Chem. and Indus., 54 (1935), No. 36, pp. 809–814*).—This paper presents a discussion of the commonly applied laboratory tests for lubricants and their interpretation in practice and indicates what appear to be vital laboratory tests for each type of lubricant. Special attention is devoted to internal-combustion engine oils.

It is concluded that lubrication is not a science having mathematical precision and that laboratory tests are not strictly comparable with running tests. It is thought, however, that laboratory tests, where correctly conducted, are in many cases indicative of the results which are generally met in practice.

The tractor fuel situation in Kansas, E. L. Barger (*Agr. Engin., 17 (1936), No. 6, pp. 241–243, figs. 4*).—The results of a survey of the tractor fuel situation in Kansas are presented in this contribution from the Kansas Experiment Station. The purposes of this survey were to obtain information on the fuels being used and the relative importance of each, and to obtain a record of the tractor owner's experiences in dealing with the fuel problem.

The preference for gasoline is outstanding, in spite of the fact that over 85 percent of the tractors in use in the State are equipped with low-grade fuel engines. It is also contrary to the fact that performance and fuel economy are improved when the high-grade fuels are burned in engines designed for their use.

Of the tractor operators using gasoline, 72.7 percent used a low- or third-grade gasoline, 27.1 percent a regular grade, and 0.2 percent premium grade. The average quantity of all fuels consumed yearly was 1,901 gal. per tractor. Those burning only gasoline averaged 2,082 gal. per tractor per year; those burning kerosene 807 gal. of kerosene per year and, in addition, 742 gal. of gasoline; and those using distillate an average of 1,208 gal. of distillate per tractor per year and also 611 gal. of gasoline. Gasoline made up 79.3 percent by volume of the fuel consumed annually by the tractors covered in this study, with distillate 16.6 and kerosene 4.1 percent. Slightly more oil was consumed when the low-grade fuels were used, but it cannot be said that the increase was of great significance.

The time between crankcase drainings for 591 tractors burning gasoline averaged 52.7 hr., for 80 kerosene-burning tractors 52.6 hr., and 217 distillate-burning tractors 49.1 hr.

Much evidence was obtained to indicate that the whole fuel problem is poorly understood by the operators.

The effect of gas pressure on piston friction, M. P. Taylor (*S. A. E. [Soc. Automotive Engin.] Jour., 38 (1936), No. 5, Trans., pp. 200–205, figs. 9*).—The effect of gas pressure on piston friction was investigated by driving with an electrical dynamometer a 6-cylinder engine with the valves removed and the valve-stem bushings plugged. Air under pressure was admitted to the closed space made up of the cylinders, valve passages, and manifolds, and a constant air pressure was maintained on the pistons. Under these conditions it was found that the friction increased approximately as a linear function of the pressure and the running speed. The effect of jacket-water temperature on piston friction was marked, but it could not be directly connected with the absolute viscosity of the oil at the temperature of the jacket water. Tests run with gas pressure relieved from behind the piston rings indicated that about a fourth of the rate of increase in friction with pressure is due to gas pressure behind the rings.

Computations from the test results indicate that the increase in friction due to gas pressure on pistons, as compared with piston friction on the ordinary motoring friction test, is in the neighborhood of from 2 to 3 lb. per square inch mean effective pressure for this type of engine.

Cylinder wear in gasoline engines, C. G. Williams (*S. A. E. [Soc. Automotive Engin.] Jour., 38 (1936), No. 5, Trans., pp. 191–196, figs. 8*).—This paper covers work carried out by the Research and Standardization Committee of Cylinder Wear in gasoline engines. The experiments were carried out on a number of single-cylinder units of 3⅝-in. bore, which can be fitted with either water-cooled or air-cooled barrels, and direct measurements of bore wear made by means of gages, piston-ring wear being measured by weighing. All readings of bore wear were taken at the top of the ring track where wear is a maximum, and the readings are expressed in equivalent wear per 1,000 miles of road operation.

Attention is drawn to the importance of corrosion under cold-running conditions. This importance was discovered through a systematic study of the effect of several different variables, showing that below certain cylinder-wall temperatures there was a very rapid increase in wear. The study was confirmed by observations on the stained or pitted appearance of the cylinder walls and piston rings of engines which had run at low cylinder-wall temperature, the presence of relatively large quantities of water in the lubricating oil under such operating conditions, the fact that the sudden increase in cylinder wear occurred when the cylinder-wall temperature approximated the calculated dew point or condensation temperature of the products of combustion at the pressure existing during the combustion cycle, and that the use of corrosion-resisting materials, namely, austenitic cast iron, for piston rings and cylinders effects a considerable reduction in wear under low-temperature conditions.

The importance of thermostats in reducing cylinder-liner wear is shown, as is also the rapid increase in wear with increasing mean effective pressure and cold-running conditions.

It is concluded from the result of the experiments on lubricants that pure medicinal paraffin gives inadequate protection from corrosion under cold-running conditions, and that the presence of a fatty acid or fatty oil is necessary under such conditions. At high cylinder-wall temperatures representing abrasive conditions pure medicinal paraffin gave a very low rate of wear that was

approximately the same as that of commercial lubricant, and various additions of fatty oils to the pure medicinal paraffin did not effect any marked improvement in wear.

The effect of increasing skirt clearance from 0.0058 to 0.0300 in. on the wear of the top piston rings was quite marked, while the effect on cylinder wear was much less appreciable. The effect of radial piston ring pressure was not of great importance, particularly within the range of pressure usually met with in practice. The effect of increasing piston ring width from 3/64 to 3/16 in. at high cylinder-wall temperature, that is, under abrasive conditions, was quite important, the rate of wear with the narrower rings being from five to seven times greater than that with the wide rings.

Automobile equipment for field work, A. T. STRAHORN (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-MP-1, pp. [1]+3, pl. 1*).—A brief discussion is presented of the manner in which automobiles are equipped for use in extended survey trips in remote sections.

Electrical heating of soil in frames, C. P. QUARRELL (*Jour. Min. Agr. [Gt. Brit.], 43 (1936), No. 5, pp. 446–452, fig. 1*).—The results of a conventional type of experiment on the use of electricity for the heating of soil in hotbeds are briefly presented. In this experiment it was attempted to simulate commercial greenhouse conditions with early garden market crops, including lettuce and carrots.

Seven ranges, each consisting of 41 Dutch lights, were used in the experiments. Four ranges were heated by the electric cables and three ranges were retained as controls.

While the cables were laid at a depth of 8 in. below the surface, the results of the experiment seemed to indicate that a depth of 5, or even 4, in. would have been more effective without causing excessive drying out of the soil.

Under the conditions of the experiment the desired temperature of 60° F. was reached only on sunny days and was not maintained for any length of time. Further fluctuations between night and day soil temperatures were considerable in the heated ranges.

Under the conditions of this experiment, electric power for the purpose of soil heating proved too expensive to be of commercial value. If it had been possible to provide thermal insulation for the frames, considerably higher temperatures would have been obtained. It is considered possible that the application of soil heating one month earlier in the year to these crops would give better results by reason of the higher market prices obtainable.

Home-made electric hay hoists, H. L. GARVER (*Wash. State Col. Ext. Bul. 206 (1935), pp. 4, figs. 2*).—This equipment is briefly described and illustrated.

Design of a machine for harvesting buffalo grass seed, F. J. ZINK (*Agr. Engin., 17 (1936), No. 5, pp. 197, 198, figs. 3*).—In a brief contribution from the Kansas Experiment Station the design of a machine for harvesting buffalo grass seed is described and the specifications enumerated.

Processing feeds on Nebraska farms, E. E. BRACKETT and E. B. LEWIS (*Nebraska Sta. Bul. 302 (1936), pp. 24, figs. 9*).—This bulletin reviews work by others on the subject and gives a brief account of the work in feed grinding at the station. Special attention is drawn to the economy of feed grinding and to the mechanical features of grinders best adapted for this purpose.

Effect of artificially drying seed cotton before ginning on certain quality elements of the lint and seed and on the operation of the gin stand, F. L. GERDES and C. A. BENNETT (*U. S. Dept. Agr., Tech. Bul. 508 (1936), pp. 62, pls. 3, figs. 13*).—Studies are reported with 60 American upland cottons selected from the 1931, 1932, and 1933 crops to represent a wide range of seed cotton charac-

teristics. Obtained from nine States including and extending from Georgia and the Carolinas to Texas, they varied in moisture content from 6.8 to 26.4 percent, in staple length from ⅞ to 1 [illegible] in., and widely in other characteristics.

Portions of the seed cottons, dried and undried, were ginned on new and properly adjusted brush and air-blast types of gins at constant saw speeds and with loose and tight seed-roll densities (slow and fast rates of feed, respectively). However, since the effects of drying were observed to be similar for the two types of gins, only the results for the brush type gin are presented.

"The amount of moisture removed from seed cottons by drying at a temperature of 150° F. increased with increase in moisture content on the average from 1 lb. per 100 lb. of seed cotton for those with less than 12 percent moisture to 3 lb. for those having 16 percent or more. The amount of moisture removed at the higher temperatures was only slightly greater than that at 150°, presumably due to the relatively short period of exposure in the drier (15 sec.) and to the fact that the relative humidity of the air heated to the higher temperatures is not appreciably lower than that at 150°.

"The greater part of the drying action on seed cotton is confined to the fibers. The amount of moisture removed from lint per 100 lb. by drying at 150° ranged from an average of 1.5 lb. for seed cottons below 12 percent in moisture to an average of 4 lb. for those having 16 percent or more, and increased slightly with higher drying temperatures.

"The moisture content of seed cotton has a pronounced effect on the smoothness with which it is possible to gin the lint, successively lower preparation being associated with increases in moisture content. The unfavorable effects of ginning cottons with excess moisture are intensified as the staple length of the cotton is increased and as the seed-roll density is changed from loose to tight.

"Average grade improvements, or the combined influence of generally smoother preparation and occasionally brighter color and reduced leaf, as a result of artificial drying, were more pronounced for the longer than for the shorter cottons. Drying at a temperature of 150° showed grade benefits ranging, on the average, from about one grade for either length group having 16 percent or more moisture to approximately one-third of a grade for the longer cottons having 8 to 11.9 percent and the shorter cottons having 12 to 15.9 percent moisture. Cottons having a moisture content below these respective limits did not show enough grade improvements to justify drying.

"Staple length, on the average, was preserved when the seed cotton was dried at 150°, but higher drying temperatures were in general accompanied by ginned lint with slightly shorter staple length as shown by classification and with increased variability of fiber length. In many cases drying temperatures above 200° were associated with shortening of staple to an extent of $\frac{1}{32}$ to $\frac{1}{16}$ in.

"Average fiber strength was not weakened by drying the tested seed cottons at temperatures up to 200°, but there appeared to be a slight weakening of the fibers when the material was dried twice in succession at 250°. The temperature of the hot air at the inlet of the drier should not greatly exceed 150°, except for very wet cotton and then should seldom, if ever, exceed 200°. The critical temperature is reached sooner with short-staple or lower moisture-content than with long-staple or higher moisture-content cottons, respectively.

"Based on average grade and staple premiums and discounts at Memphis, Tenn., for the 1932–33 season, drying long-staple cottons of relatively high moisture, averaging 14 percent, increased the average monetary value per bale about $3, or 8 percent, when ginning with a loose seed roll, and $2, or 6 percent, with a tight roll. Drying and ginning with a loose roll increased the average

value of the same cottons approximately $7, or 20 percent, as compared with that for corresponding portions ginned damp or wet with a tight seed roll. Long-staple cottons having an average of 10.8 percent moisture showed increases in value from drying of over $3, or 10 percent, when ginned with a loose seed roll, and $1, or 3 percent, with a tight roll. Ginning portions with a loose seed roll after drying gave an increase in value of over $4, or 14 percent, as compared with the value of the cotton obtained with a tight seed roll without drying.

"With short-staple cottons of relatively high moisture, averaging 15 percent, the average monetary value per bale was increased 67 ct., or almost 2 percent, by drying when ginned with a loose seed roll, and 68 ct., or 2 percent, with a tight roll. The value of these cottons dried and ginned with a loose seed roll was higher by almost $1.50, or 4 percent, than that obtained when portions were ginned damp or wet with a tight seed roll. Shorter staple cottons averaging 10.8 percent in moisture showed decreases in monetary value with drying. . . .

"The beneficial effects of artificial drying, as shown by the differences between paired samples, are considered as being probably of smaller magnitude than would have resulted had machinery been used in these experiments that was more or less worn out or obsolete, or inadequately repaired, or improperly operated."

The percentage germination of seed from portions of seed cotton dried at test temperatures was not reduced by drying; on the contrary, the dried portions showed germination of slightly higher percentages.

An appendix presents basic tables showing absolute values of paired undried and dried samples.

Drying fruits and vegetables, H. Beresford (*Elect. on the Farm, 8 (1935), No. 9, pp. 10, 11, figs. 2*).—A fruit and vegetable drier, suited to the needs of the farm family and adapted for operation by electric heat, is briefly described and illustrated.

Installing forced draft in prune driers, F. E. Price (*Oreg. State Hort. Soc. Ann. Rpt., 27 (1935), pp. 90–92*).—The results of experience at the Oregon Experiment Station on the installation of fans in natural draft driers is briefly presented.

Home-made potato sorting table, H. L. Garver (*Wash. State Col. Ext. Bul. 222 (1936), pp. 4, figs. 2*).—This device is briefly described and diagrammatically illustrated and a bill of materials presented.

Investigations on machinery used in spraying.—II, Nozzles, C. Davies and G. R. B. Smyth-Homewood (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 62–85, pls. 11, figs. 7*).—This is the second report of these experiments (E. S. R., 72, p. 705), in which a method to determine the surface area of trees covered by spray fluid is described.

Results obtained in the field under commercial conditions showed an average cover of about 78 percent. An analysis of the uniformity and degree of atomization of spray deposit on the trees showed the spray cover efficiency to average 62 percent. Further experiments were conducted in the field under various pump and nozzle conditions, and the cover ranged from 60 to nearly 92 percent. A number of nozzles were tested in the laboratory, and the methods used and some of the apparatus developed are briefly described.

Heating systems for apple-washing machines, R. H. Reed (*Illinois Sta. Circ. 457 (1936), pp. 37, figs. 11*).—Technical information is presented on heating systems for apple washing machines, together with data on installation and

operation. An appendix presents methods used in analyzing heat losses and transfers.

Purdue Experiment Station reports on effect of "Freon" on fruit in storage, C. E. BAKER (*Heating, Piping, and Air Conditioning, 8 (1936), No. 3, pp. 94, 96, 98*).—Studies conducted at the Indiana Experiment Station are briefly reported in which Freon appeared to be a safe refrigerant for use in the storage of apples from the toxicity standpoint. Its presence in the atmosphere seems to be harmless, except possibly in the case of extreme concentrations.

Poultry houses for Manitoba, M. C. HERNER (*Manitoba Dept. Agr. and Immigr. Ext. Bul. 103 (1936), pp. 31, figs. 24*).—Information is presented on the planning and construction of poultry houses adapted to conditions in Manitoba, together with working drawings and building material for specific structures.

Practical electricity and house wiring, H. P. RICHTER (*Chicago: Frederick J. Drake & Co., 1934, pp. 183, figs. 208*).—This is a practical book of instruction covering in detail electrical work as applied to the wiring of small buildings. It contains chapters on electricity and how it is measured; dictionary of common devices; principles of circuits; wires and insulation; splicing and soldering; underwriters—electrical codes; two- and three-wire systems; polarizing and grounding; fuses and circuits; wiring methods; service wires and switches; plan your installation; wiring new houses—knob-and-tube; wiring with conduit; wiring with armored cable; wiring with nonmetallic cable; installing switches, fixtures, etc.; miscellaneous useful additions; wiring houses after they are built; alterations and additions; wire sizes; wiring farm buildings; motor characteristics—motor wiring; principles of efficient lighting; AC and DC—single-phase and three-phase; appliances—home repairs; and isolated plants.

Description of home-made air coolers, L. H. MITCHELL (*Reclam. Era [U. S.], 26 (1936), No. 8, p. 196, figs. 2*).—Home-made air coolers originated on the Salt River project of the U. S. Bureau of Reclamation during 1935 are described.

The air cooler is made of a wooden box made to fit tightly in the lower half of a window, a bit of excelsior, a tin trough perforated to spread water through the excelsior, and a good-sized electric fan. The fan draws air through the moistened excelsior and in doing so lowers its temperature. The temperature of a room can be lowered 10° or 15° with one of these home-made air coolers.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Kentucky Station, 1935] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 8–14*).—Findings not previously noted are reported briefly on a study in cooperation with the U. S. D. A. Bureau of Agricultural Economics of adjustments in agricultural production and farm practices necessary to conserve fertility and prevent erosion; a study of population growth and its relation to land use and relief in 5 counties with good-sized cities and 27 mountain counties in the eastern part of the State; a study of 104 colored part-time farming families in central Kentucky; studies of farm real estate tax delinquency, 1928–33, and of farm land assessments; a study of the relation of the number of turkeys in the United States and Kentucky prices for turkeys; a study of the factors responsible for the increase in volume of fruit and vegetable markets in Louisville during recent years; and a study of factors influencing net earnings of 72 farm operators in the outlying bluegrass counties of the State.

It still pays to farm well, H. W. MUMFORD (*Illinois Sta. Circ. 458 (1936), pp. 31, figs. 9*).—This is an address delivered on Farm and Home Week programs

at the Universities of Kentucky, Missouri, Illinois, and Wisconsin during 1935 and 1936. Portions were adapted for use in a paper before the Chamber of Commerce of the United States in April 1936.

A study of the organization and management of farms in Grayson County, Virginia, J. J. VERNON, T. M. DEAN, and H. W. HAWTHORNE (*Virginia Sta. Bul. 304 (1936), pp. 63, figs. 4*).—The farming area studied is described as "livestock grazing with enough crops grown to winter the breeding stock and to carry the other livestock that was either raised on the farm or purchased during the fall into the next year's grazing season." An analysis is made of records for the year ended March 31, 1931, obtained by trained enumerators for 162 full-time farms and 170 farms receiving 15 percent or more of receipts from sources other than the farm.

The full-time farms showed the following averages: Size 158 acres, capital investment $8,724, receipts $667, expenses $644, and labor income —$429. The averages for the part-time farms were 105 acres, $5,149, $592, $516, and —$191, respectively. Increasing size of business was associated with decreasing labor income, due to increased interest allowance on capital investment. "Generally, it did not pay to hire labor during the year of the study. Groups of farms with the least number of men made the best financial showing. Farm income showed a small, increasing positive relationship with increases in size of farm on the full-time farms but an irregular declining negative relationship on the part-time farms. Capital was used more efficiently on large than on small farms, indicated by a constantly decreasing proportion of capital invested in real estate being invested in nonproductive buildings and a large proportion in productive land. Also, large farms used working capital somewhat more efficiently than small farms. . . . Crop yields declined as the acres of crops per animal unit increased, indicating that livestock help to maintain or improve the fertility of the soil. Although crop sales were of minor importance, increasing crop yields were associated with increasing farm income, indicating that good crop yields probably had some joint influence on farm income. Certain items of cost of production may be materially reduced by high crop yields." The group of full-time farms with nearly one-fourth of the total capital investment in working capital showed by far the largest farm income. Tenants had a decided advantage over landlords in the year studied—a depression year. "There was a significant positive relationship between the output per man and farm income."

The data indicated that a good balance of enterprises on full-time farms would result from a business organization providing for from 10 to 20 percent of total receipts from crop sales, 50 to 60 from cattle, 15 to 25 from sheep, 5 to 10 from poultry, and from 5 to 10 percent from dairy products. For part-time farms the percentages from sales of crops were from 15 to 20 percent, from cattle 30 to 40, from sheep 15 to 25, from poultry 15 to 25, and from dairy products from 5 to 10 percent.

Trends in West Virginia agriculture, F. D. CORNELL, JR. (*West Virginia Sta. Bul. 276 (1936), pp. [83], figs. 36*).—Tables based on reports of the Bureau of the Census, U. S. Department of Commerce, for the years from 1870 to 1935 show by counties total population; number and average size of farms; acreages of improved and unimproved farm land; acreages, yields, and production of the principal farm crops; number of apple and peach trees and production; number of horses, cattle, dairy cows, sheep, swine, and poultry; production of milk and eggs; etc. Charts and maps show similar data for the State by years for periods of varying lengths from 1865 to 1935. The trends are briefly discussed.

An economic study of part-time farming in the Elmira and Albany areas of New York, 1932 and 1933, K. HOOD ([*New York*] *Cornell Sta. Bul*

647 (1936), pp. 139, figs. 9).—Data were collected by personal visits by graduate students, 267 completed schedules being obtained in the Elmira area in 1932 and 458 in the Albany area during the summer of 1933. The population and industrial development in each area are described. The numerous tables included present the findings as to farm receipts and expenses; operator's income from farm and total; family income; the location of the farms as regards the type of roads, distance to city, soil type, and class of land; classification of part-time farmers on the basis of occupation, schooling, age, etc.; size, condition, etc., of dwellings; capital investment and the factors influencing it on part-time farms; extent of farming operations and the effects of different factors on them; influence of various factors on operator's net earnings from the farm and on nonfarm earnings; area and returns from gardens; percentage of food furnished by the farm and the factors influencing the percentages; methods of marketing produce; factors influencing the appreciation of real estate values of part-time farms; cost of living in the country and in the city and the factors influencing the amount of net savings on part-time farms; factors influencing taxes paid on and the cost of renting part-time farms; and the factors influencing the amount of poor relief paid part-time farmers. Other tables present data in regard to selecting and purchasing part-time farms, construction of dwellings, modern conveniences in the country, etc. The advantages and disadvantages of living in the country and the attitude of full-time farmers toward part-time farmers are discussed.

Cost of producing farm products in North Carolina, R. E. L. Greene (*North Carolina Sta. [Bul.] 305 (1936), pp. 127*).—This bulletin presents the results of a number of studies of the cost of production of different farm products in North Carolina made from 1924 to 1934.

Part 1. *The application of the factors of production* (pp. 6–13).—This part "is devoted to a discussion of theoretical relationships between inputs or cost factors and outputs or yields. This discussion is intended to show how outputs vary with inputs and the economic significance of such relationships."

Part 2. *Cost of producing cotton in selected areas of North Carolina* (pp. 14–38).—Records were obtained (1) by the cost route method from 23 to 36 farms mostly in Wayne, Johnston, and Harnett Counties each year, 1930–34, and include 1,638 acres of cotton during the 5 yr. and (2) by the survey method in 1934 from 59 farms with 3,431.8 acres of cotton in Hoke, Scotland, Richmond, and Anson Counties. Tables show for each farm, for the 3 high- and 3 low-cost farms, and for the high-yield farms for each year the costs by items and yields. The causes for the difference in cost per pound of cotton on the different farms are discussed.

Part 3. *Cost of producing tobacco in selected areas of North Carolina* (pp. 39–54).—Records were obtained by the cost route method from 5 to 19 farms each year, 1931–34. A total of 241 acres of tobacco was included. Most of the farms were located in Wayne, Johnston, and Harnett Counties, but a few records were obtained in 1934 in Green, Pitt, and Wake Counties. Tables show for each year for each farm, for the 3 high- and 3 low-cost farms, and for the high-yield farms the costs by items, yields, value of tobacco sold, and profit per acre. The causes of the differences in yields and costs are discussed.

Part 4. *Cost of producing farm products in selected areas of North Carolina* (pp. 55–119).—Using the farm business records obtained in connection with studies previously noted (E. S. R., 65, p. 782), calculations were made of the cost of producing cotton, corn, tobacco, peanuts, wheat, sweetpotatoes, soybeans, hay and forage, dairy products, poultry products, and pork and of the costs of work stock labor and man labor. From 20 to 24 enterprise records were ob-

tained in Cumberland and Johnston Counties in 1924, Craven County in 192; Macon County in 1926, and Northampton County in 1927. In general, table are included for each product showing for each farm and the averages for th farms in each area the labor and material requirements per acre, the cost o production by items, yields, etc.

Part 5. *Cost of producing early Irish potatoes in selected areas of North Carolina* (pp. 120–127).—In cooperation with the extension service of the North Carolina State College of Agriculture, 38 records were obtained for the 1934 crop year from farms in 9 areas of the State by the cost route method. Tables show for each farm, for the farms by areas, and for the 5 high- and 5 low-cost farms the costs of production and marketing by items and the average number of hours of man labor and horse work used per acre in different operations.

Canadian wheat stabilization operations, 1929–35, W. S. Evans (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 12 (1936), No. 7, pp. [2]+249–271+[1] figs. 3*).—In a period dating from the beginning of the crop year 1929–30 in the United States and continuing in Canada until the close of the crop year 1934–35, centralized wheat cooperatives, with the support of government money and credit, operated in the wheat markets of their respective countries on a scale never before possible to any regular market agencies and therefore affording important lessons in the principles of marketing.

In an introductory way, the developments in connection with the operations of the cooperative in the United States are herein sketched. The developments in Canada are more fully presented, the main elements of the Canadian situation between August 1931 and July 1935 being assembled in graphic form.

The Butler Egg Auction, R. H. McDougall and F. F. Lininger (*Pennsylvania Sta. Bul. 328 (1936), pp. 44, figs. 12*).—This is a study of egg marketing in western Pennsylvania showing preferences of buyers and the factors of production influencing price and quality. The Butler Egg Auction was organized in the spring of 1933, and in 1935 had a membership of 437 in 14 counties. The study was made "first, to discover remediable weaknesses of the auction as disclosed by interviews with buyers and sellers; second, to compare prices received by different methods of marketing and for various weights and grades of eggs; and, finally, to determine how quality affected price, what external factors were related to price, and how these factors might be controlled." Sixty-two buyers were interviewed, and information was obtained from 28 others by questionnaires. Three hundred and eighty members and 29 nonmembers of the auction were interviewed, and a study was made of the sales slips of the 2 sales (Tuesday and Friday) nearest the fifteenth of each month, January 1934 to June 1935.

The organization, financing, and operation of the market are described. Analyses are made of the data obtained, with comparisons of auction prices and the New York and Pittsburgh prices of eggs and of prices by other methods of marketing. Flock management practices and the relation of seasonal variation in sales, weight and grade of eggs, etc., to prices received are discussed.

During the 2-yr. period ended June 30, 1935, the auction sold 1,281,792 doz. eggs at an average price of 25.7 ct. per dozen. The handling charge was 40 ct. per case. "The Butler Egg Auction has improved the local prices of eggs by establishing recognized grading standards for size and quality. It has widened the market area so that all high quality eggs in the area command a ready sale. It has provided the first reliable price quotations for graded eggs in the 14 counties included in the territory. . . . The price for Butler Extra Large eggs averaged 1.4 ct. above New York Nearby Specials and 4.7 ct. above Nearby Hennery Whites in Pittsburgh for the 2 yr., July 1933 to July 1935. For the

period July to December 1934, Butler Extra Large eggs averaged 4.15 ct. above New York Nearby Specials. The huckster and the store prices for the 3-yr. period July 1932 to July 1935 were very close together. The huckster paid 2.1 ct. above the store from October 1934 to May 1935, while before the auction the store prices were frequently above the huckster price. The consumer price averaged 0.3 ct. above the New York Nearby Specials and 4.8 ct. above the huckster price from July 1932 to July 1935. The general level of prices appears to have been raised so that they approached more nearly the New York Nearby Special and the consumer prices."

Buyers attended the sales irregularly, only 14 percent attending weekly. In 1934, due apparently to improved local prices for eggs, 22 percent of the members did not sell through the auction, and over 70 percent sold at less than 15 percent of the sales. Of the buyers interviewed, 75 percent sold direct to consumers and 66 percent preferred heavy-weight eggs, light yolks, and Fancy and Extra grades and 87 percent white shells. There was a consistent relation between weight of and the price paid for eggs. With large eggs, each increase of 1 lb. in weight per case increased the price per dozen on an average of 0.4 ct. Seasonal variation in volume of eggs sold was the chief factor affecting prices. Tuesday sales averaged 47 ct. per case above Friday sales, indicating a need for a change in sales day or delivery of a part of the producers' eggs. "Experience with auction selling of eggs indicated that a strict adherence to grading standards was desirable. Under such conditions the auction offered to producers an incentive to produce eggs of high quality."

The supply and utilization of milk in Pennsylvania, T. K. Cowden and E. G. Fouse (*Pennsylvania Sta. Bul. 327 (1936), pp. 111, figs. 28*).—The data given are based upon individual reports submitted by dealers to various agencies, such as the milk control board, public health agencies, and various trade organizations. These reports were supplemented and checked by interviews with individuals in the industry. Detailed figures are tabulated for April 1934, which was approximately the same as the monthly average for the year. The findings are presented in sections dealing with the plan of the study and Pennsylvania as a milk market; number, location, and relative importance of the various types of dealers; the supply of milk handled by different types of dealers; country milk plants; seasonal variation in the supply of milk; the utilization of milk and cream by Pennsylvania dealers; the fluid milk industry of the State; milk manufactured in the State; seasonal variation in the utilization of milk; farmers' organizations in the dairy industry; the relation of sanitary control to the supply and utilization of milk in Pennsylvania; and interstate shipments of milk and cream.

Sale of dairy products at roadside markets in Maryland, DeV. Meade and R. K. Mead (*Maryland Sta. Bul. 394 (1936), pp. 595–626, figs. 15*).—This study was made to determine the factors influencing the demand for and sale of dairy products at roadside markets in the State. A survey was made of eight markets remaining open all year and five that were open only from 4 to 9 mo. Data are included with regard to hours open, general appearance, location with reference to roads, distance to a town, parking space, facilities and attractions, traffic, service equipment, methods of sales practices, prices, effect of climate on sales, etc. The various factors and their effects on sales are discussed.

Agricultural loans of commercial banks, N. J. Wall (*U. S. Dept. Agr., Tech. Bul. 521 (1936), pp. 56, figs. 7*).—Data regarding the specific types of agricultural loans, total loans, and total deposits were obtained from schedules enclosed by the Federal Deposit Insurance Corporation, the Comptroller of the Currency, and the Federal Reserve Board with the call report form for Decem-

ber 31, 1934, sent out by each agency. Data compiled for somewhat similar surveys conducted by the Department for the years 1914, 1918, 1920, 1923, and 1931 were used for making rough comparisons of changes in the volume of agricultural loans.

Loans secured by real estate increased from $739,500,000 in 1914 to nearly $1,500,000,000 in 1920 and then decreased to less than $500,000,000 in 1934. Personal and collateral loans to farmers increased from approximately $1,608,-000,000 in 1914 to over $3,869,000,000 in 1920 and then decreased to $807,613,000 in 1934. Of the agricultural loans held by commercial banks on December 31, 1934, 38.2 percent were secured by farm real estate, 8 by livestock only, 12.2 by crops, equipment, and livestock, 11.1 by warehouse receipts, and 4 percent by other collateral, and 26.5 percent were unsecured by collateral. The percentages that agricultural loans were of total loans in the different geographic divisions were New England 2.4, Middle Atlantic 1.7, East North Central 10.9, West North Central 28.9, South Atlantic 14.3, East South Central 25, West South Central 23.2, Mountain 39.1, Pacific 11.6, and the United States 9. Slightly over 60 percent of the loans secured by real estate were in the Pacific, East North Central, and West North Central States. Of the loans secured by livestock only, 78.5 percent and of those secured by crops, equipment, and livestock, 75.4 percent were in the West North Central, West South Central, and Mountain States. Of the agricultural loans secured by warehouse receipts, 85.8 percent were in the South Atlantic, East South Central, and West South Central divisions. Of the total agricultural loans in the United States secured by other collateral, 3.6 percent were in the New England division, 8.1 in the East South Central division, 7.4 in the Mountain division, and from 11.9 to 16 percent in each of the other divisions. Of the loans without security other than endorsement, 61.4 percent were in the Middle Atlantic, East North Central, and West North Central divisions. Banks in places of less than 15,000 population held 65 percent of the loans secured by farm real estate, 80 percent of the personal and collateral loans to farmers, and 74 percent of all agricultural loans. National banks held 48.4 percent of all agricultural loans, nonmember State banks 43.8, and State member banks 7.8 percent.

An analysis is made of the relation of agricultural loans and rural buying power and of the influence of price level on bank loans, the refunding of bank loans into long-term obligations, bank suspensions, and Federal financing for farmers.

Maryland farm credit handbook, R. Russell (*Maryland Sta. Bul. 396 (1936), pp. 635–690, figs. 2*).—Part 1, the farm credit situation in Maryland (pp. 636–643, 677–679), includes data as to amount and sources of operating credit and farm mortgage credit and the number of farms changing hands through forced sales and related defaults. Part 2, credit and services available through the Farm Credit Administration (pp. 644–676, 680–690), "is designed to guide farmers who need credit or whose debt burden needs readjustment. It attempts to outline the sources and conditions of farm credit obtainable through federally sponsored agencies." It describes the several agencies and outlines the conditions under which farm credit may be obtained from each.

An analysis of real estate assessments in 28 Virginia counties, 1930, F. L. Underwood (*Virginia Sta. Bul. 303 (1936), pp. 38, figs. 2*).—This analysis is based on data regarding sale values and assessed values of land and buildings, and number of acres or lots each sale represented for all real estate (1,927 sales) sold in 27 counties in Virginia in 1930 for which complete information was obtainable.

The ratio of assessed to sales value was 42.8 percent for 950 sales of land with buildings, 29.1 for 669 sales of land without buildings, 55.9 for 137 sales of lots with buildings, and 24.4 percent for 171 sales of lots without buildings. The county averages varied from 13.8 to 119.7 percent for land with buildings, from 12.5 to 92.8 for land without buildings, from 12.3 to 155.6 for lots with buildings, and from 1 to 181.8 percent for lots without buildings. In general the lowest ratios were in the southwestern and the highest in the southeastern part of the State. Less than one-sixth of the properties were assessed at full valuation or higher, more than one-fourth at less than 21 percent of the sales value, and more than one-fourth at from 21.6 to 40 percent.

In general, properties of low sales value were relatively overassessed and those of high value were underassessed. Properties with buildings were generally assessed at much higher percentages than those without buildings. A strong and consistent inverse relationship was found between sales value per acre and the ratio of assessed to sales value. No consistency was found in the relationship between acreage and the ratio of assessed to sales value.

In 1930 the boards of equalization in the 21 counties dropped 271 assessments, added 631, and reviewed 6,447. In summarizing the work of the boards, the author states that "it was found that generally the boards had reduced rather than increased assessments, and that such increases as were made, as well as such decreases, bore little or no relation, either in extent or frequency, to the previous assessment situation. Many assessments already too low relative to the average assessment ratio for the county were still further reduced, and a few already too high were still further increased. In the analysis of variations in real estate assessments it was found that properties without buildings were assessed at much lower percentages of sale value than were properties with buildings. The aggregate net change made by boards of equalization in assessments of land without buildings was a reduction of 55 percent, whereas the aggregate net change in assessments of land with buildings was zero. In other words, land without buildings, already assessed at a lower ratio to sale value than land with buildings, was reduced in assessed valuation by more than one-half, while the aggregate of assessments of land with buildings remained unchanged. Buildings were found to be generally overassessed in relation to land. For land with buildings, the boards of equalization increased aggregate building assessments by 4 percent and reduced the corresponding land assessments by 2 percent."

Local government in Tompkins County, New York, T. N. HURD ([*New York*] *Cornell Sta. Bul. 657 (1936), pp. 44, figs. 9*).—Tompkins County—its location, area, units of government and their origin, population, taxable property, and highway mileage—and the administration of the governmental units—towns, counties, schools, cities, villages, and special districts—are described. Tables are included and discussed showing the general property tax levies by years, 1817–1933, for State, county, town, school, city, and other purposes; the town expenditures of the towns of Groton and Newfield and the county receipts and expenditures, 1832, 1882, and 1932; the town and the county receipts and expenditures by years, 1918–1933, and the town and the county receipts and expenditures by items, 1932, 1933, and 1934; and the expenditures for county highways, welfare, protection, and health, 1932. The trends of tax levies and expenditures, the apportionment of the cost of government, the efficiency of governmental administration, and possible changes in organization and administration are discussed.

Use and value of highways in rural New York, W. M. CURTISS ([*New York*] *Cornell Sta. Bul. 656 (1936), pp. 30, fig. 1*).—An analysis is made of data

secured (1) in 61 traffic counts including 198 roads in the 9 rural New York counties previously studied (E. S. R., 62, p. 278) and covering the year ended January 1935; (2) in 179 12-hr. daylight traffic counts at 46 stations, including 168 roads in Tompkins County, during the same period; and (3) from 5,125 answers from farmers in 52 counties in the State to a questionnaire regarding use of automobiles and trucks, types of roads on which their farms were located, and estimated worth to them of improved roads.

In the 9 rural counties the average number of vehicles per hour increased from approximately 29 in 1926–27 to 39.2 in 1934. The percentages of the increases, 1926–27 to 1934, in the average number per 12-hr. day were passenger cars 19 percent, commercial traffic, mostly trucks, 78, horse-drawn vehicles, −69, and other vehicles, including school busses, motorcycles, taxicabs, and dealers, 10 percent. In Tompkins County in 1934 the average numbers of vehicles per hour were State highways 46.2, county roads 6.7, and town highways 2. Eighty-four percent of the traffic was passenger cars and 15 percent commercial vehicles. Of the traffic, 70.7 percent originated in the county and 29.3 outside the county (2.1 percent from outside the State). Of the 5,125 farmers answering the questionnaire, 90 percent owned automobiles and 52 percent trucks. The automobiles were driven an average of approximately 7,000 miles per year and were used an average of 268 days per year. The trucks were driven an average of 5,768 miles per year, of which 488 miles were on the farm, and were used an average of 255 days per year. It was estimated by 3,355 farmers—1,047 on dirt roads, 764 on gravel roads, and 1,544 on hard-surfaced roads—that it is worth on the average $9 per acre to a farm to have a dirt road graveled and $21 per acre to have it hard-surfaced.

Crops and Markets, [August 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), No. 8, pp. 257–296, figs. 2*).—Included are reports, summaries, charts, etc., covering crop and livestock estimates; market reports for livestock and livestock products, dairy and poultry products, fruits, vegetables, cold-storage holdings, grains, feeds, seeds, and cotton, and the price situation and price movements of important agricultural products.

Agricultural statistics, 1936 (*U. S. Dept. Agr., 1936, pp. 421*).—This volume, prepared under the direction of J. A. Becker et al. (the Yearbook statistical committee), "brings together what seem from experience to be the most important agricultural statistics of the United States and of the world so far as the agriculture of this country is concerned." This information was formerly published in the statistical section of the Yearbook of Agriculture (E. S. R., 74, p. 120).

Statistics are included for different grains, cotton, sugar, tobacco, different fruits and vegetables, miscellaneous crops, beef cattle, hogs, sheep, horses, mules, dairy cattle, poultry, dairy and poultry products, foreign trade in agricultural products, farm business and related subjects, and miscellaneous items, including forestry, weather, roads, fertilizers, insecticides and fungicides, cooperative associations, freight rates, cooperative extension work, etc. "Historical revisions prior to 1919 are shown for wheat, corn, oats, barley, cotton, and potatoes, by which the currently published estimates have been made consistent with the decennial census figures, supplemented by State enumerations." Fourteen summary tables included indicate in a general way some of the results of the Agricultural Adjustment Administration.

[**Agricultural statistics**] (*U. S. Dept. Agr. Yearbook 1936, pp. 1143–1174*).—Included are 28 tables selected from Agricultural Statistics, 1936, above noted. "The series given here is limited to subjects which experience indicates are of relatively universal public interest."

RURAL SOCIOLOGY

Geography: An introduction to human ecology, C. L. White and G. T. Renner (*New York and London: D. Appleton-Century Co., 1936, pp. X+790, figs. 333*).—This is a presentation of the geographic approach to the study of human ecology. The book is divided into 10 parts, including the nature and scope of geography, the geographical unit, and the climatic, biotic, physiographic, edaphic, mineral, hydrographic, spatial, and social factors.

Wisconsin's human and physical resources, E. L. Kirkpatrick and A. M. Boynton (*Madison: Res. Sect., Resettlement Admin., Region II, 1936, pp. [10]+173, pl. 1, figs. 81*).—A graphic presentation of conditions affecting rural rehabilitation.

Some aspects of rural social organization in Fairfield County, Ohio, C. E. Lively, R. C. Smith, and M. Fey (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 91 (1936), pp. 11+[11], pls. 9*).—After presenting the general characteristics of Fairfield County, the authors discuss the pattern of county organization and social groups, their nature and membership.

More than half of the rural population of the county dwell on farms and about one-fourth live in incorporated villages. Of the open country memberships in rural social groups, 60 percent were in groups meeting in the 12 major trade centers of the county.

The trend of births, deaths, natural increase, and migration in the rural population of Ohio, C. E. Lively and C. L. Folse (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 87 (1936), pp. 10+[14], pls. 6*).—This publication was prepared with the cooperation of the Federal Emergency Relief Administration. The Ohio Bureau of Vital Statistics provided the data on births and deaths.

Farm youth in the United States: A selected list of references to literature issued since October 1926, compiled by E. M. Colvin (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 65 (1936), pp. V+196*).—This bibliography is designed to supplement and bring to date the material contained in Agricultural Economics Bibliography 17 (E. S. R., 56, p. 84).

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition of the Tennessee Station] (*Tennessee Sta. Rpt. 1935, pp. 28, 29, 34–36, fig. 1*).—These progress reports include a description of a method devised by G. A. Shuey for the preparation of a high quality noncrystallizing sorghum sirup; data obtained by F. L. MacLeod on the vitamin C content of strawberry juice and the vitamin G content of green string beans, green and white cabbage, green peas, and sweetpotatoes; and a preliminary report of an investigation under the direction of MacLeod to determine if dicalcium phosphate and other phosphates manufactured by the TVA can be utilized to advantage by animals.

Food plants of the North American Indians, E. Yanovsky (*U. S. Dept. Agr., Misc. Pub. 237 (1936), pp. 84*).—As noted in the foreword by F. V. Coville, "this publication is a summary of the records of food plants used by the Indians of the United States and Canada which have appeared in ethnobotanical publications during a period of nearly 80 yr." The compilation contains 1,112 species belonging to 444 genera of plants distributed among 120 families. The information on each plant includes its botanical name, a brief description of the portion of the plant used as food with the common method of preparation, the region in which it is found, and references to the literature which include 78 citations.

A summary of the families included, with number of genera and species of each, and a complete index add to the usefulness of the publication.

A new subjective method of testing tenderness in meat—the paired-eating method, S. Cover (*Food Res., 1 (1936), No. 3, pp. 287–295*).—The subjective method for comparing the effect of differences in one factor only in the cooking process upon one quality of the cooked meat of different cuts, described in this contribution from the Texas Experiment Station, was suggested by the paired feeding method described by Mitchell and Beadles (E. S. R., 63, p. 393). It is called the paired eating method and was developed in an investigation of the effect of low and high oven temperatures on the tenderness of standing rib and round-bone chuck roasts cooked to the same internal temperature.

In this method the paired roasts for the cooking are identical cuts from the right and left sides of the animal. After these are roasted at the two oven temperatures to the same internal temperature, two or three slices are taken from the center of each roast. The paired slices are further cut into paired strips and each strip into paired small samples about ¼ by ½ by ½ in. The small paired samples are then judged for relative tenderness by each member of the judging committee.

The results obtained over a period of 2 yr. are discussed from the standpoint of the reliability of the new method as compared with the standard judging method of the National Meat Investigations Committee, and summarized as follows:

"(1) The majority of the judgments for both cuts is in favor of the constant low oven temperature method—125° C. (257° F.). (2) This majority is larger in the case of the round-bone chuck roasts. (3) The difference in tenderness between the two methods of cooking is more 'decided' in the case of the round-bone chuck roasts than of the standing rib roasts. (4) This difference is most 'decided' in the case of the lowest grade carcasses, thus emphasizing the importance of low oven temperatures in cooking the cheaper grades of meat."

These conclusions were supported by statistical analysis of the data and by the use of the standard method of judging. "The paired eating method for testing tenderness has the advantage of direct comparison of two paired samples. Any difference in tenderness between the two samples is easily detected and conveniently recorded. The results of a large number of such paired observations may be depended upon to bring out clearly any difference which is present. The method has proved to be decidedly satisfactory for testing differences in tenderness of meat resulting from two methods of cooking, and it is suggested, therefore, to other workers for trial in testing other factors of palatability of meat or other foods wherever similar suitable comparisons may be arranged. It is suggested also as a suitable method to use in perfecting the various objective methods of testing tenderness of meat. It should be emphasized, however, that this method is applicable only to those cases in which the difference between two comparable samples is the important consideration. It cannot be used for comparing a large number of individual roasts with each other, nor for comparing individual roasts cooked on different days."

The effect of high and low oven temperatures on the tenderness of meat, S. Cover (*Jour. Home Econ., 27 (1935), No. 8, p. 542; also in Texas Sta. Circ. 78 (1936), pp. 23, 24*).—This abstract summarizes the results obtained in the comparisons of the tenderness of roasts cooked at two different temperatures in the investigation noted above.

The calcium, phosphorus, and nitrogen retention of rats on soybean-egg powder and whole milk powder diets, E. Reid (*Chin. Jour. Physiol., 9 (1935), No. 4, pp. 307–313*).—In continuation of previous studies (E. S. R., 71,

p. 722), further evidence was obtained on the antirachitic properties determined by calcium and phosphorus retentions, on the nitrogen retention, and on the digestibility of soybean-egg powders of different composition and of two whole milk powders when fed to rats. Soybean-egg powders No. 1 and No. 2 were previously described, and No. 3 and No. 4 were prepared from boiled soybean milk supplemented with peanut oil, dextrin, lactose, and sodium phosphate, as well as egg yolk, cane sugar, calcium lactate, and sodium chloride before spray-drying. These last two powders differed in the amounts of calcium lactate and sodium hydrogen phosphate added.

The results showed that soybean-egg powder No. 4 promoted greater nitrogen retention and digestibility, greater calcium retention, and to a lesser extent greater phosphorus retention than the other soybean-egg preparations. It also promoted a slightly greater nitrogen retention and digestibility than one whole milk powder and approximately equal calcium and phosphorus retention. Tables are presented giving the percentage composition of soybean-egg powders and whole milk powders and the calcium, phosphorus, and nitrogen balances.

The influence of fruit ingestion before meals upon the bacterial flora of stomach and large intestine and on food allergins, O. BERGEIM, A. HANSZEN, and L. ARNOLD (*Amer. Jour. Digest. Diseases and Nutr., 3 (1936), No. 1, pp. 45–52*).—This paper reported a favorable effect of premeals of oranges, apples, and particularly bananas in preventing passage of viable bacteria into the large intestine and on the utilization of proteins, fats, and carbohydrates of the subsequent meals. Some work was done on allergens in this connection.

Garlic breath odor, M. A. BLANKENHORN and C. E. RICKARDS (*Jour. Amer. Med. Assoc., 107 (1936), No. 6, pp. 409, 410*).—Observations are reported contradicting the conclusion of Haggard and Greenberg (E. S. R., 74, p. 427) that garlic and onion breath odors arise "solely from particles of onion or garlic retained in the structures of the mouth."

Three patients, one with obstruction of the esophagus necessitating feeding through a gastrostomy fistula and the other two with complete separation of the respiratory tract from the pharynx, necessitating breating through a tracheotomy fistula, had garlic breath after the ingestion of onions or garlic or the corresponding oils. In another experiment three subjects were given garlic in a mixed vegetable salad and 18 hr. later, when marked garlic odor could be detected on the breath, were given a 1-percent solution of chloramine mouth wash and the breath odors tested at frequent intervals. For from 30 min. to an hour the garlic odor was scarcely noticeable, after which it became very pronounced.

The authors conclude that garlic and onion odors come from the air passages and not from the food passages and that mouth washes merely mask the offending odor and do not cure it.

Poisonous substances in food, particularly spray residue on fruits and vegetables, from the point of view of the city health officer, J. C. GEIGER, G. H. BECKER, and A. B. CROWLEY (*Amer. Jour. Pub. Health, 26 (1936), No. 4, pp. 382–384*).—In this paper, read before a joint session of the Association of Dairy, Food, and Drug Officials and two sections of the American Public Health Association, poisoning resulting from spray residues on fruits and vegetables is discussed from the standpoint of public health. Such poisoning has chronic, cumulative effects and the possibilitiy of endangering the health of the masses. Its very nature frequently makes it difficult to connect end results with the causative agent. The solution suggested is to investigate the toxic effect of all new insecticides with reference to man, to replace insecticides by materials less toxic, and to set proper tolerance limits for spray residues.

"Sufficient data exist on chronic intoxication of various kinds to indicate that the public health hazard involved in the use of insecticides is worthy of the most serious attention. We cannot wage a battle against the insects with utter disregard of the effects of that warfare on man."

Refrigeration of foods and its relation to present-day public health, B. E. Proctor et al. (*Amer. Pub. Health Assoc. Yearbook, 1935–36, pp. 47–51*).—This report of the Committee on Foods discusses recent developments in food refrigeration from the standpoint of their relationship to public health. Data are summarized on the quantities of different foods held in cold storage in 1935 and the exportation of refrigerated meats, vegetables, and fruits in 1934. In the discussion of the quality of refrigerated foods a distinction is made between the physiological or biochemical age and the chronological age of foods, and the opinion is expressed that as more is learned about the physiological and biochemical changes taking place in foods, "it would seem that the more logical method for the determination of quality and edibility of cold storage products would be the evaluation of such changes, together with the direction of more attention to the preparation of such products for storage, and their actual storage conditions, rather than the emphasizing of storage time, or chronological age, which may sometimes be a fallacy."

Other points discussed are the microbiology of refrigerated foods, the optimum conditions of temperature and humidity for refrigeration, and the development and uses of frozen storage.

Protein and the dietary production of fatty livers, H. J. Channon and H. Wilkinson (*Biochem. Jour., 29 (1935), No. 2, pp. 350–356*).—Groups of rats were fed on substantially choline-free diets containing 40 percent of beef fat with protein varying from 5 to 50 percent for a period of 3 weeks, at the end of which their livers and carcasses were analyzed for fat. The diet containing the lowest percentage of protein was adequate for weight maintenance and the production of livers containing 12.49 percent of fat. With increased protein the fat content showed a progressive decrease, indicating that the amount of fat appearing in the liver is conditioned by the amount of protein in the diet irrespective of any action of choline. In another comparison two groups of rats were fed diets differing only in their content of protein (5 and 30 percent) at the expense of sugar and containing 20 percent of fat and 2 percent of cholesterol. The livers of the first group at the end of 3 weeks contained an average of 25.42 percent of glyceride and 4.42 percent of cholesteryl esters and of the second group 5.54 percent of glyceride and 7.91 percent of cholesteryl esters. No relationship was found between the amount of liver fat and depot fat in the carcasses.

The possibility is suggested that the action of protein in controlling liver fat may be due to its providing amino acid precursors which are converted either into choline or betaine or substances of similar physiological action.

The utilization of inulin for growth by the young white rat, A. Bendaña and H. B. Lewis (*Jour. Nutr., 10 (1935), No. 5, pp. 507–515, fig. 1*).—Purified inulin from chicory was fed to rats weighing from 65 to 75 g at the level of 1.5 g, with and without the addition of 1.5 g of sucrose or fructose in a basal diet containing casein, cod-liver oil, lard, agar, and McCollum-Davis salt mixture No. 185. Two diets contained 3 g fructose and sucrose, respectively, but no inulin. The daily food intake was limited to 3.8 and 5.3 g, furnishing 12.6 and 18.6 calories, respectively.

Increased growth resulted from the addition of inulin, sucrose, or fructose to the basal diet, but the utilization of inulin, as measured by response in growth, was distinctly inferior to that of sucrose and fructose. The results

gave no indication of how the inulin became available for energy supply. White rats fed inulin as the sole source of carbohydrate showed marked intestinal distention and died within a few days.

The distribution of choline, J. P. FLETCHER, C. H. BEST, and O. McK. SOLANDT (*Biochem. Jour., 29 (1935), No. 10, pp. 2278–2284*).—A method for the estimation of the total choline content of tissues is described, consisting of digestion of the tissue with hydrochloric acid according to the method described by Best and McHenry for the estimation of histamine, acetylation of the extracted choline, and assay of the resulting acetylcholine on the isolated intestine of the rabbit. The total choline contents of the various tissues of the normal white rat, of several tissues from other animals, and of many dietary constituents of both animal and vegetable origin were determined by this method. Among the values reported are white flour 140 mg per 100 g, polished rice 94, rice flour (various commercial brands) 73–65, rice starch 15–4.3, cornstarch 25, potato starch 0, dried skim milk 90, washed bran 28, Canadian cheddar cheese 19, fresh creamery butter 13, fresh turnip 42, tomato juice (commercial brands) 9.8–6.6, dried and powdered baker's yeast 270, brewer's yeast 240, vitamin B_1 concentrate (Kinnersley and Peters method) 22–8, fuller's earth adsorbate from extract of rice polishings 1.2, cod-liver oil concentrate 14, and vitamin E oil (unsaponifiable matter of wheat germ) 4 mg per 100 g.

The mineral composition of young rats, W. M. COX, JR., and M. IMBODEN (*Jour. Nutr., 11 (1936), No. 2, pp. 177–190, figs. 5*).—In continuation of a previous paper (E. S. R., 75, p. 677), additional data are presented on the effect of different levels and ratios of calcium and phosphorus in the diet on the inorganic composition of 10 stock and 135 experimental rats and of 8,431 young born to these mothers during 11 consecutive reproductive cycles. It was noted that "(1) the rat is relatively cartilagenous at birth, (2) the mineral content of the rat at birth is relatively constant in spite of wide differences in maternal mineral intake, (3) because of constancy in the composition of the body ash of 21-day-old rats, even when their mothers receive varying mineral intakes, the percentage of calcium and phosphorus in their gross bodies is calculable with fair accuracy from the percentage of ash, (4) with the exception of high phosphorus diets, the body ash of sucklings (21 days old) may be used as a measure of bone ash, or calcification, (5) female rats, 21 days old, contain more ash, calcium, and phosphorus than do males of the same age, and (6) during consecutive reproductive cycles the number of young born per litter decreases, but the average weight at weaning increases."

Adult rats of low calcium content, H. L. CAMPBELL, O. A. BESSEY, and H. C. SHERMAN (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 703–706*).—Adult rats were fed a varied diet adequate except that it contained only 0.094 percent calcium in the air-dry food mixture. Growth and health of the first generation were normal, but breeding was subnormal. The second generation on the same diet attained only three-fourths of the expected normal growth and size, and became senile prematurely at 1 yr. of age. No young were reared. The bodies of these rats analyzed at the age of 1 yr. had a calcium content three-fourths that of the normal controls.

The availability of calcium from some typical foods, M. L. FINCKE and H. C. SHERMAN (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 421–428*).—Feeding experiments were conducted in which young rats were placed upon a diet in which the calcium was supplied by skim milk or on diets in which half was supplied by skim milk and the other half by either dried spinach or dried kale. Animals were killed at 60 days of age and analyzed for calcium. The results

of the analyses showed that the calcium of the kale is nearly as available as that of milk, but that the calcium of the spinach is poorly or not at all available.

"That the calcium of spinach is utilized so poorly is not attributable to the presence of fiber, but appears to be at least largely due to the oxalate present in the spinach" and not present in the kale.

Nutritional anemia in rats alleviated by evaporated milk and iron, H. B. Stein, M. H. Radetsky, and R. C. Lewis (*Jour. Dairy Sci., 19 (1936), No. 2, pp. 117–124, fig. 1*).—In this study 16 groups of weanling rats, 21 days old, were given unsupplemented raw milk until they became anemic. At this point 15 of the groups were changed to a diet of diluted evaporated milk, each from a different manufacturing plant, while one group was continued on raw milk as a check. Iron as purified ferric chloride free from copper was allowed as a supplement to each group. Eleven rats from the various groups died within 3 weeks and were not counted in interpreting the data. All rats in the check group died within 8 weeks. Of the remaining 37 rats, 30 made complete recovery, while seven made partial recovery.

It is concluded that evaporated milk supplemented with iron will cure nutritional anemia, which action is ascribed to the copper content of the milk.

The copper content of some human and animal tissues, P. F. Hahn and E. Fairman (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 161–165*).—In this study the authors found that the copper content was increased to a high level in the spleen and to a lesser extent in the liver as the iron stores decreased in these organs in anemic dogs.

The copper content in the organs of young and adult patients dying from a number of diseases showed no variation from the average normal adult value obtained by 14 investigators. In two cases of Mediterranean anemia the copper as well as the iron content of the liver was above normal.

The livers of infants and fetuses were high in copper values.

[Iodine studies of the Kentucky Station] (*Kentucky Sta. Rpt. 1935, pt. 1, pp. 18–20*).—This progress report summarizes recent studies on the effect of iodine on the growth of rats; the iodine and bromine content of 16 samples of brines from the oil-bearing strata in eastern Kentucky and of 4 well and 3 spring waters from 7 counties in the State; the iodine content of several vegetables grown with and without the addition of potassium iodide to the soil; and the iodine content of 17 human goitrous thyroids obtained on autopsy.

A note on the physical examination of children, F. C. McDonald (*New England Jour. Med., 215 (1936), No. 5, pp. 189–191*).—An outline is presented and discussed of an elaborate method of physical examination of children which has been developed in the Pediatric Teaching Clinic of the Boston Floating Hospital. The principal change from methods previously employed consisted in a much more careful examination of the skin, muscles, and skeletal framework.

An investigation of the diet of school children, A. Anderson (*Brit. Med. Jour., No. 3936 (1936), pp. 1221, 1222*).—School children in the upper departments of elementary schools in Chorley, England, an industrial town, recorded the items of food consumed on September 17 and December 10, 1935, as a memory test. The total number of meals recorded were 9,160 in September and 7,889 in December. At a routine medical inspection of 1,280 of the children, 19.3 percent were classified on a nutritional basis as excellent, 68.2 percent as normal, 12.3 percent as slightly subnormal, and 0.2 percent as bad. The results, based on the percentage frequency of the items in the diet, indicated an apparent deficiency in milk, soup, eggs, fish, cheese, fruit, vegetables, and puddings. A study of individual records showed little evidence of home cooking. Potatoes were chiefly recorded as chips, meat appeared as meat pie, fruit as tinned fruit

or in pies or tarts, and cake or biscuits were substituted for pudding. The December dietary was less satisfactory than the September.

Heights and weights of 275 public school girls for consecutive ages 7 to 16 years, inclusive, E. B. WILSON (*Natl. Acad. Sci. Proc., 21 (1935), No. 12, pp. 633, 634*).—In this statistical treatment of the data indicated in the title, tabulations are given of the mean height in centimeters and weight in kilograms, the increments of height and weight, and the standard deviation and coefficient of variation for weight and height for each age group. In another table are given correlation coefficients for height with height, weight with weight, and height with weight for each of the 10 age intervals.

The weight-weight correlations in general were less than the height-height correlations for corresponding years. The weight-weight correlation was lowest at the earliest age, 7–8 yr., and dropped again slightly at 13–14 yr., the age at which the height-height correlation was lowest. The correlation of height with weight fell off from 0.77 at 7 yr. to 0.42 at 16 yr.

Hemoglobin and red cell content of the blood of normal women during successive menstrual cycles, R. M. LEVERTON and L. J. ROBERTS (*Jour. Amer. Med. Assoc., 106 (1936), No. 17, pp. 1459–1463, figs. 2*).—In determining the hemoglobin and red cell counts of four normal college women on a constant adequate diet for 3 mo., the authors found daily variations which in both were not greater than the experimental error. The average standard deviation of all hemoglobin determinations was 0.9 g per 100 cc of blood, and that of red cells was 0.31 million per cubic millimeter. The hemoglobin values rose during the period of study from 12.95, 12.54, 11.62, and 13.06 g per 100 cc for subjects A, B, C, and D, respectively, for the first menstrual cycle to 14, 13.92, 13, and 14.3 g during the last cycle. This increase indicated a storage of iron from a diet containing from 10 to 15 mg of the mineral. The red cell count remained constant for all the subjects during the 3-mo. experimental period. An additional intake of 5 mg of iron from ferric ammonium citrate given daily to one subject during menstrual cycles 4 and 5 resulted in an increased red cell content of 0.5 million per cubic millimeter and an increased hemoglobin content of 1 g per 100 cc. During cycle 6, when iron therapy was discontinued, the hemoglobin content dropped 0.7 g and the red cell content 0.83 million.

The results of this investigation appeared to indicate no definite effect of the process of menstruation on hemoglobin and red cell values. The marked daily variations occurred irrespective of the different phases of menstrual cycles, and emphasized the need of recognizing them when evaluating "the significance of single determinations or the influence of the menstruation process on these blood constituents."

Metabolism of women during the reproductive cycle.—VI, A case study of the continuous nitrogen utilization of a multipara during pregnancy, parturition, puerperium, and lactation, H. A. HUNSCHER, F. C. HUMMEL, B. N. ERICKSON, and I. G. MACY (*Jour. Nutr., 10 (1935), No. 6, pp. 579–597, figs. 3*).—This continuation of a series of papers noted previously (E. S. R., 69, p. 751) reports an uninterrupted nitrogen metabolic response during the last 145 days in gestation and the extension of these observations into parturition, puerperium, and 8 weeks of lactation. Nitrogen balances were made intermittently on the woman in two former reproductive cycles. Both subject and children enjoyed buoyant health during the 8-yr. period under observation.

The results show an accumulated retention of 446 g of nitrogen during gestation. Loss on the day of delivery from the body beyond the amount consumed amounted to 54.6 g of nitrogen through blood, placenta, amniotic fluid, and vomitus and approximately 58.6 g through the fetus. The loss during the

lying-in period averaged 5 g of nitrogen daily, and during lactation from the tenth to the fifty-third day averaged 0.87 g. The maternal reserve of nitrogen during the reproductive cycle embraced by this study was 250 g. The authors discuss the need for the high retention of nitrogen. Tables and figures are given summarizing nitrogen analyses and balances.

Studies on growth, III, IV, W. H. GRIFFITH (*Jour. Nutr., 10 (1935), No. 6, pp. 667–682, figs. 3*).—In continuation of the studies on growth noted previously (E. S. R., 69, p. 899), two papers are presented.

III. *B and G avitaminosis in cecectomized rats* (pp. 667–674).—This paper contains observations on the effects of cecectomy in rats on adequate and vitamins B- and G-deficient diets to determine whether vitamins B and G were synthesized by micro-organisms in the cecum. Cecectomy was performed 1 day after weaning. The basal diet of Evans and Burr was supplemented with cod-liver oil and, as designated, with autoclaved hog liver for vitamin G, fuller's earth adsorbates from rice bran or wheat embryo extracts for vitamin B, or dried brewer's yeast for supplying the vitamins in the B complex. This supplemented diet permitted normal growth. Coprophagy was prevented by raised cages with bottoms of wire mesh.

Cecectomy had no effect on the normal growth of rats on an adequate diet during an observation period of 100 days. Diets deficient in either vitamin B or G, or both, produced the same rate of failure in growth and deficiency symptoms in the cecectomized and control rats. Improvement in response on these deficient diets was noted when the animals were allowed access to the feces. The author concluded that if cecal micro-organisms synthesized vitamins B and G, these were excreted and could only be utilized by the rat by consuming the feces.

The prolonged survival of rats on a vitamin G-deficient diet, from 50 to 100 days as compared to from 20 to 50 days on a vitamin B-deficient diet, is not due to a cecal supply of the vitamin.

IV. *The vitamin B and G content of the body tissues of normal and experimental rats* (pp. 675–682).—These observations made on young rats were in agreement with those reported previously (E. S. R., 69, p. 469) on adult rats.

"It is suggested that vitamin G may function in part as a tissue constituent."

The vitamin A content of Hunan lachiao, Capsicum annuum, L. var. longum, H. C. HOU (*Chin. Jour. Physiol., 10 (1936), No. 1, pp. 171–178, figs. 7*).—With Sherman's curative method of vitamin A assay it was found that dried redpepper was fairly rich in vitamin A, 0.3 g of the powder giving a growth response in rats slightly better than that of one Sherman unit but similar to that obtained with 0.006 mg of carotene.

"Three extractions with boiling alcohol for 1 hr. each removed only about one-half of the total vitamin A content of dried Hunan lachiao."

The vitamin B_1 content of foods, A. Z. BAKER and M. D. WRIGHT (*Biochem. Jour., 29 (1935), No. 7, pp. 1802–1807, figs. 2*).—In this investigation the bradycardia method described by Birch and Harris (E. S. R., 73, p. 567) for quantitative determinations of vitamin B_1 was compared with the growth rate method. When the vitamin B_1 activity of samples of vitamin B_1 concentrate, wheat germ, and ox liver were determined by both methods, the values indicated the bradycardia method to be reliable. The values obtained by feeding graded doses of the vitamin B_1 international standard showed that between the dose levels of from 20 to 30 mg the bradycardia method gave an accuracy within ±20 percent. It was therefore used for assaying a large number of human foods in the form in which they were normally eaten. The values were reported in terms of the international standard vitamin B_1.

The ranges in values obtained for different foods in the same food groups were (excepting those with probable errors for the dose used of over 50 percent) for meat and glandular organs, roast leg of chicken 0.4 and raw pig kidney 3.4 international units per gram; fish, raw cod muscle 0.4 and fried halibut 0.6; vegetables, raw celery and cooked turnip trace and raw lentils 2.1; fruits, green grape pulp trace and dried fig 1; nuts, desiccated coconut trace and hazelnut 2; cereals and cereal products, whole wheat 2.3–3.4 and wheat germ 5.9–18.75; and cheese, cheddar 0 and gorgonzola 0.3 international units per gram. Other items of interest are milk 0.23, boiled egg yolk 1.4, and dried brewer's yeast from 6 to 23 international units per gram.

Vitamin C content of raw, cooked, and canned rhubarb, J. A. Clague, C. R. Fellers, and W. Stepat (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 624–626*).—This study, made at the Massachusetts Experiment Station, gave evidence that rhubarb is a good source of vitamin C, as determined by biological tests with guinea pigs and by the reduction method with 2,6-dichlorophenolindophenol.

"The protective level for guinea pigs was 3 to 4.5 g daily. Cooking the rhubarb into sauce caused a loss of 30 to 40 percent of the antiscorbutic factor. Rhubarb canned in water did not protect guinea pigs from scurvy when fed at a daily level of 7 g (5.3 g of rhubarb). As determined by the titration method, fresh, cooked, and canned rhubarb contained, respectively, 0.117, 0.032, and 0.016 mg of ascorbic acid per gram, corresponding to calculated protective daily feeding levels of 4.3, 9, and 22.7 g. The ascorbic acid titration and the animal assay methods yielded comparable results."

Effect of shipping, freezing, and canning on the ascorbic acid (vitamin C) content of peas, C. R. Fellers and W. Stepat (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 627–633, figs. 2*).—In continuation of studies (E. S. R., 73, p. 417) made at the Massachusetts Experiment Station, the authors determined the ascorbic acid (vitamin C) content of peas of two principal varieties, Thomas Laxton and Alderman Telephone, grown in southern New Jersey and central New York.

Cooked, fresh, and frozen peas were good sources of ascorbic acid (vitamin C), and canned peas were a fair source of the vitamin. The two varieties of peas showed no marked differences in ascorbic acid. The protective levels of peas by the Sherman bioassay method with guinea pigs were for market peas 1–2 days old, 2–2.5 g; cooked market peas, 2.5–3 g; cooked frozen peas, 4.5–5.5 g; reheated canned peas, 6.5–8.5 g. Using the 2, 6-dichlorophenolindophenol titration method described by Bessey and King (E. S. R., 71, p. 137), the titration values in milligrams of ascorbic acid per gram for these products showed, respectively, the following: 0.174, 0.137, 0.109, and 0.057 mg which when calculated as protective levels were 2.9, 3.7, 4.6, and 7.8 g, respectively. "Raw, freshly picked immature peas showed a mean value of 0.354 mg per gram. Peas defrosted for several hours retained only 0.041 mg, a loss of nearly 70 percent of the amount present in the frozen vegetable. Shipment or storage of peas in the pod for 1 or more days had a marked destructive effect on their ascorbic acid content. Cooking either fresh or frozen peas caused a loss of 6 to 12 percent in ascorbic acid. Reheating canned peas in an open vessel to 180° F. caused very little loss of ascorbic acid."

The rôle of vitamin C in the organism as suggested by its cytology, G. Bourne (*Physiol. Rev., 16 (1936), No. 3, pp. 442–449*).—This paper reviews the literature bearing on the function of vitamin C in the body and includes 58 references on the subject. The ability of the vitamin to combine with important substances to form oxidation-reduction systems indicates that it is a promoter of

cellular syntheses, particularly in the suprarenals and anterior pituitary and perhaps in the corpus luteum and interstitial cells of the gonads.

The action of vitamin C on blood vessels [trans. title], H. BRUCH and N. C. VASILESCU (*Klin. Wchnschr., 15 (1936), No. 14, pp. 490, 491, figs. 3*).—It was observed in this study that 1 cc of a vitamin C solution injected intravenously in persons slowed the pulse from 10 to 15 beats per minute. Using the plethysmograph, it was further observed that the blood vessels of the arms and legs were dilated. Atropine injected intramuscularly from 15 to 20 min. before the injection of a vitamin C solution interfered with the dilatory stimulation of the blood vessels. Histamine, which when injected lowers the blood pressure and injures the capillaries, was injected several minutes before vitamin C injection and did not prevent an increased volume of blood in the vessels. It is suggested that vitamin C stimulates the vagus nerve, resulting in vasodilation.

The fate of vitamin C in the digestive tract.—I, The effect of intestinal bacteria on vitamin C [trans. title], W. STEPP and H. SCHRÖDER (*Klin. Wchnschr., 14 (1935), No. 5, pp. 147, 148, fig. 1*).—Cultures of bacteria from the intestinal tract were suspended in an agar medium to which was added a 10-percent ascorbic acid solution in normal saline, a synthetic nutrient solution, or milk. After 24 hr. at an incubation temperature (37° C.) the ascorbic acid was titrated with N/100 iodine solution. The H-ion concentration was determined before and after each experiment.

The results showed that vitamin C was almost completely destroyed by 8 strains of *B[acillus] coli communis* and *B. paratyphosus*, and that destruction was not due to an increase in alkalinity in the medium.

The results may have a significant application to the fate of vitamin C in the intestine of man.

Vitamin C requirements during pregnancy and lactation [trans. title], W. NEUWEILER (*Klin. Wchnschr., 14 (1935), No. 50, pp. 1793, 1794, fig. 1*).—The urine of 21 nonpregnant, 23 pregnant, and 22 nursing women was titrated with 2,6-dichlorophenolindophenol to determine hourly the amount of ascorbic acid excreted during 3 hr. following intravenous injection of 200 mg of ascorbic acid. All the subjects were free from disease and partook of the same hospital diet. The experiment was carried on during the summer months.

The results showed that the requirement for vitamin C was higher during lactation than during pregnancy and much higher than during normal periods. Additional ascorbic acid is suggested for nursing and pregnant women.

The effect of incomplete diets on the concentration of ascorbic acid in the organs of the rat, F. G. HOPKINS and B. R. SLATER (*Biochem. Jour., 29 (1935), No. 12, pp. 2803–2819, figs. 2*).—Six diets, one complete and the others incomplete in one or more of the main constituents carbohydrates, proteins, or fats, were fed to groups of rats, an animal known to synthesize vitamin C, to determine the effect on the content of ascorbic acid in the liver and the intestines. The ascorbic acid values were determined by the titration method of Birch, Harris, and Ray (E. S. R., 70, p. 741) and were submitted to statistical analysis.

The incomplete diets, with a salt mixture added, were fed to male albino rats weighing from 150 to 200 g for 3 days after a 2-day fast in one series and from 5 to 7 days without a previous fast in another series. Food consumption, except for the pure protein diet which was therefore discontinued, was normal in quantity. The average ascorbic acid content of the organs of animals on normal diet was 0.26 mg. After 48 hr. without food the value in the intestines rose to an average of 0.41 mg and that in the liver remained normal. The average ascorbic acid values in the organs of animals fed the incomplete diets for from 5 to 7 days without fast were as follows: Carbohydrate alone, 0.32 mg

in the liver and 0.24 mg in the intestines; protein and carbohydrate, 24 and 27 mg; fat and carbohydrate, 23 and 26 mg; protein and fat, 25 and 39 mg; and fat alone, 28 and 36 mg, respectively. The values in the organs of animals fed the incomplete diet for 3 days with a 2-day fast approximated those given above.

These results indicated that a diet of carbohydrate alone induced a large increase of ascorbic acid in the liver, suggesting that this food constituent is the precursor of vitamin C and that the liver is the site of its formation. The fall of ascorbic acid values in the liver to normal during a fast or carbohydrate-free diet and the corresponding sudden rise in the value in the liver suggested that during these periods the intestine proceeds to synthesize vitamin C, presumably from other precursors than carbohydrates. This adjustment in the intestine to a change in the diet was very rapid. The concentrations of ascorbic acid in the liver and intestines of rats fed a carbohydrate-free diet for 12 days showed a return to normal levels in both organs. The results tended to dismiss the possibility of these organs as seats of storage for vitamin C.

An appendix by G. A. Millikan on The Identity of Ascorbic Acid and the Reducing Agent of Rat's Gut reports the comparative rate of reduction of *2.6-dichlorophenolindophenol* by these two substances and by cysteine, using the continuous flow method developed for nonhemoglobin reactions. A diagram of the apparatus and the directions for using it are given. Results showed that the rate of reduction of the reducing substances in the rat intestine followed closely that of pure ascorbic acid solution up to 60 percent completion of the reaction, after which it was a little slower. Cysteine solution reduced the dye 350 times slower than ascorbic acid solutions when measured under the same conditions.

Some observations on the excretion of ascorbic acid, H. E. Archer and G. Graham (*Lancet [London], 1936, I, No. 13, pp. 710–713, figs. 3*).—Data on the ascorbic acid content of the urine (determined by the method described by Harris and Ray (E. S. R., 73, p. 427)) of an elderly man with scurvy showed that the amount excreted for the first 6 days varied from 6 to 18 mg daily. Administration of 30 cc of orange juice containing 187 mg of ascorbic acid increased the amount excreted only slightly, from 10 to 19 mg daily. When a total of 1,870 mg of ascorbic acid had been ingested, only 150 mg were excreted. During the 32-day observation period the total intake of ascorbic acid was 4,950 mg, while the amount excreted averaged 53 percent of the intake. In another patient the amount excreted on an ascorbic diet was from 10 to 16 mg. After a total ascorbic acid intake of 1,600 mg the amount excreted averaged 48 percent of the intake and after 3,200 mg 75 percent. In the case of a healthy man the known intake over a period of 6 days was 1,200 mg and the amount excreted was 1,236 mg. The discrepancy was explained by the high intake of a previous diet.

These observations suggest that the percentage output is more valuable evidence in diagnosis of scurvy than the amount of ascorbic acid taken before excretion increased, or the amount excreted after a test dose.

Ascorbic acid in cataract, with special reference to dinitrophenol cataracts, E. M. Josephson (*Science, 82 (1935), No. 2123, pp. 222, 223*).—Marked improvement was noted within a few days after the administration of from 0.015 to 0.3 g per day of ascorbic acid to patients with cataract, as shown by slit-lamp microscopic studies. Mature and hypermature cataracts became sufficiently clear to permit examination of the eye grounds and vision improved from total or subtotal blindness to counting fingers. The rapidly progressive dinitrophenol cataracts responded rapidly by supplementing food rich in glutathione content with ascorbic acid. Typical neuritis associated with dinitrophenol poisoning

also responded promptly to the ascorbic acid therapy. Regeneration of lens fibers in the eye that had been aphakic following cataract extraction for many years was found to occur with ascorbic acid therapy.

In regard to dinitrophenol poisoning, the author stated that "this raises the question as to whether the toxic effects of dinitrophenol may not be due to the destruction of the auto-oxidative system elements of the cells as a result of the hyperoxidation which it induces, or whether it be due to direct chemical interaction with them."

Photochemical phenomena involved in vitamin G (B_2) studies, G. C. Supplee, S. Ansbacher, and R. C. Bender (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 365–374*).—In this paper evidence is presented on the growth-promoting properties and behavior of the lactoflavine concentrates of milk. The term lactoflavine is frequently used synonymously with the term vitamin G (B_2). The yellow-green fluorescent fractions of a crude milk vitamin concentrate promoted growth in rats when fed in quantities of less than 1 mg a day. Natural and artificial light with radiations between 3,100 and 4,800 a. u. changed the fluorescence to blue and destroyed the growth-promoting properties. Oxygen accelerated and foreign substances in solution or suspension retarded the photochemical change.

***The suggested relation between cystine and vitamin B_2*, F. T. G. Prunty and M. H. Roscoe** (*Biochem. Jour., 29 (1935), No. 11, pp. 2491–2497*).—This investigation, made in 1932, was based on the suggestion that protein in the form of purified casein used in vitamin B experiments might be deficient in cystine. The later work of Itter et al. (E. S. R., 73, p. 726) suggested that vitamin B_2 deficiency was frequently complicated by a deficiency of a sulfhydryl-containing substance. Rats were fed on five experimental diets, all of which contained casein 20 percent, rice starch 60, cottonseed oil 15, and McCollum's salt mixture No. 185 5 percent and were cooked in a steamer for from 3 to 5 hr. with water. The diets were supplemented with daily doses of cod-liver oil and vitamins B_1 and B_2 concentrates. Three preparations of casein in the diets were used, and two diets were supplemented by 25 percent additional cystine. The cystine content for the diets was 0.019, 0.046, 0.062, 0.269, and 0.312 percent, respectively. Two of the purified caseins, the Glaxo purified caseinogen and the Lister purified caseinogen, appeared not to have enough cystine for the growth of rats, but this deficiency did not affect the occurrence of dermatitis due to vitamin B_6 deficiency. Within the limits observed the cystine intake of the rats did not affect the glutathione content of the tissues.

The vitamin G complex.—I, The non-identity of rat dermatitis due to vitamin B_6 deficiency and the dermatitis of human pellagra, W. J. Dann (*Jour. Nutr., 11 (1936), No. 5, pp. 451–462*).—Evidence is presented in support of the view that the vitamin B_6 of György and the pellagra-preventive factor of Goldberger are not identical. This was determined by experiments with rats and by clinical experience with pellagra patients.

Sixteen rats were fed the vitamin B-free diet of György for 30 days, followed by the same diet supplemented daily with 10γ of crystalline vitamin B_1 and twice weekly with 20γ lactoflavine. On this regimen the rats failed to gain weight and developed the specific dermatitis of vitamin B_6 deficiency. The animals were divided into two groups of 6 rats each according to the severity of the dermatitis, and each rat in group 1 was given 1 g of white corn meal daily and in group 2 1 g of yellow corn meal daily. The remaining 4 rats served as negative controls. Rapid cure of the dermatitis even when it was severe was brought about by the corn meal. Another group of 49 rats was divided into two groups, one of which was kept in the light and the other in the dark.

Both groups developed dermatitis among a similar proportion of rats in the average time.

Clinical experience showed that pellagra patients receiving a standard basic diet containing 143 g of white corn daily and 2 and 4 cc of a solution of lactoflavine containing 0.5 mg per cubic centimeter given subcutaneously were not relieved from the symptoms of pellagra. Valentine's liver extract administered by mouth cured the symptoms in from 5 to 7 days.

The fact that corn meal is curative of rat dermatitis but not human pellagra is thought to indicate that vitamin B_6 is not identical with the human pellagra-preventive factor. Of even greater significance is the fact that rat dermatitis can be produced in the dark, while, according to the clinical experience of Ruffin and Smith in human pellagra, the dermatitis of the exposed surface is closely dependent upon the action of sunlight on the patient's skin.

The influence of dextrin and sucrose on growth and dermatitis, R. C. Bender, S. Ansbacher, G. E. Flanigan, and G. C. Supplee (*Jour. Nutr., 11 (1936), No. 5, pp. 391–400, figs. 5*).—A basal ration containing dextrin 62 parts, hydrogenated vegetable oil 10, vitamin-free casein 20, Steenbock's salt mixture 40 4, powdered agar agar 2, and cod-liver oil 2 parts and supplemented with 12.5γ vitamin B_1 and 10γ lactoflavine promoted a substantial rate of growth in young rats and prevented the development of dermatitis. When the dextrin was replaced by sucrose, the basal ration supplemented with the same factors did not prevent the development of dermatitis and did not permit normal and continued growth. The dermatitis appeared in from 82 to 100 percent of 42 and 96 rats, respectively. Lactoflavine-free crude milk vitamin concentrate supplementing the sucrose ration did not prevent the incidence of dermatitis. Rice polish concentrate and lactoflavine supplementing the sucrose ration cured dermatitis in 4 weeks and permitted a good growth response. This evidence indicated an antidermatitis factor in the rice polish. The incidence of dermatitis was delayed on an average of from 3 to 4 weeks and occurred with less regularity on the sucrose ration with 10 percent hydrogenated vegetable oil than on the 3 percent level.

It is concluded that the sucrose ration with lower fat level and supplemented with adequate vitamin B_1 and the vitamin factor or factors contained in rice polish concentrate is suited for the determination of growth-promoting properties of lactoflavine.

The characteristic dermatitis resulting from the sucrose ration is illustrated with a colored photograph.

Lactoflavin, a necessary growth-promoting dietary factor, S. Ansbacher, G. C. Supplee, and R. C. Bender (*Jour. Nutr., 11 (1936), No. 5, pp. 401–409, figs. 3*).—When rats were fed the sucrose ration noted above and supplemented with 12.5γ vitamin B_1 and 25 mg of the rice polish concentrate, none of the animals developed dermatitis but the weight remained practically stationary. When the rats received in addition to the above supplements 5γ lactoflavine no improvement in growth was noted, but with 10γ and 20γ of lactoflavine the gain in weight became satisfactory. The results obtained by increasing the rice polish concentrate to 50 mg were a gain of 13 g with 5γ of lactoflavine supplement, 28 g with 10γ, and 38 g with 20γ in 7 weeks. The potency of the lactoflavine was calculated to be 150,000 units per gram.

On the nature of factor L, a specific dietary factor for lactation, W. Nakahara, F. Inukai, and S. Ugami (*Imp. Acad. [Japan] Proc., 11 (1935), No. 9, pp. 362–364*).—In continuation of the work noted previously (E. S. R., 73, p. 415), the authors precipitated the factor L from the nonadsorbable fraction of liver extract with barium hydroxide and phosphotungstic acid, indicating its char-

acter to be a nitrogen-containing acid. Female rats were placed on a factor L-deficient diet consisting of polished rice powder, fish protein, butter, McCollum salt mixture, and dried yeast for 2 weeks, which was sufficient time to deplete the rats of this factor. During the following weeks of gestation, parturition, and lactation, the diet of some of the animals was supplemented with the phosphotungstic acid precipitate.

The lactating rats receiving approximately 51 g of the phosphotungstic acid precipitate were able to rear 58.5 percent of the young as compared to 1.02 percent reared by the control females receiving no supplement to the diet.

Studies on dietary requirements for lactation.—V, Presence of a second lactation factor in yeast, W. Nakahara, F. Inukai, S. Kato, and S. Ugami (*Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers, 29 (1936), No. 628, pp. 47–52, fig. 1*).—The L-deficient diet noted above was rendered more completely deficient by substituting acid earth adsorbate of yeast extract for dried yeast. The modified diet was found to be adequate for growth but not to support lactation.

The results showed that the basal diet supplemented with the acid earth adsorbate and the phosphotungstic acid precipitate allowed 10 percent of the young to be weaned as compared with 58.5 percent of young reared on the diet noted above. It was concluded that two specific factors are required for lactation. The second factor, designated as L_2, is nonadsorbable on acid earth and is present in yeast.

The anemic state, with particular reference to the anemias of childhood, R. R. Kracke and H. E. Garver (*Arch. Ped., 52 (1935), Nos. 8, pp. 521–546; 9, pp. 585–608*).—A brief discussion is given of the development of blood cells during fetal life and at various age levels in children, followed by the normal blood picture in infants, children, and adults. Factors influencing red cell and hemoglobin values are then discussed, including age and sex, individual requirements, iron, copper, protein, gastric acidity, liver storage, yeast and vitamin B_2, oxygen tension, and pregnancy. A classification of anemias is given, with corresponding therapy. The anemias of children are finally discussed under the classification of hypochromic deficiency anemias, hyperchromic deficiency anemias, hemolytic anemias, and other childhood anemias.

Included in the review are original data on blood studies of 312 college girls between the ages of 17 and 24 yr., on the relation of menstruation to anemia in 315 college women, and on blood studies of 77 male and female mill workers and their children.

Treatment of nutritional anaemia of infants, L. G. Parsons (*Brit. Med. Jour., No. 3932 (1936), pp. 1009, 1010*).—The treatment recommended for nutritional anemia of infants consisted of aqueous solutions of inorganic iron such as 12 grains of ferrous sulfate, 3 grains of reduced iron, or 12 grains of iron and ammonium citrate, in each case divided into three doses and given daily; of 5 cc of a 1 percent solution of copper sulfate per kilogram of body weight; and of from 1 to 3 dr. of dried yeast, which was reported "to act as a 'potentiator' of iron in the synthesis of hemoglobin." Yeast contains iron, copper, vitamin B, and cytochrome containing a pyrrole ring.

The prevention of hypochromic anemia in pregnancy, J. C. Corrigan and M. B. Strauss (*Jour. Amer. Med. Assoc., 106 (1936), No. 13, pp. 1088–1090, figs. 2*).—Of 100 women receiving an average of 0.5 g ferrous sulfate daily during the last 4 mo. of pregnancy, none had less than 70 percent hemoglobin 1 week after childbirth, the average being 85 percent (13.26 g per 100 cc) or a gain of 12 percent over the average values in the sixth month of gestation. Of a similar group of 100 women selected alternately with those receiving the iron and given similar tablets containing only lactose, 24 had less than 70 percent

hemoglobin 1 week after childbirth, and the average hemoglobin value was the same (73 percent) at the end as at the beginning of the period of observation. The average erythrocyte count after childbirth was 3,940,000 per cubic millimeter in the control group and 4,280,000 per cubic millimeter in the treated group.

"The conclusion is drawn that hypochromic anemia in pregnancy may be largely prevented by the routine administration of iron, especially in the latter months of gestation."

Study of the alimentation of peasants in the pellagra area of Moldavia (Roumania), W. R. Aykroyd, I. Alexa, and J. Nitzulescu (*Arch. Roumain. Path. Expt. et Microbiol., 8 (1935), No. 4, pp. 407–426, figs. 2; Fr. abs., pp. 422–426*).—This report presents mortality figures for pellagra in Rumania by provinces for the years 1930–34, discusses the seasonal, age, and sex incidence of pellagra found in Moldavian villages, with general dietary habits and standards of living of the people, and gives the results of a quantitative dietary survey covering five periods and a total of 240 days in the years 1933–35.

The results of the dietary inquiry showed that the energy value of the diet exceeded the 3,000 calories usually allowed an average man at moderate work. The protein intake, while in excess of 100 g a day, was of poor biological value. The carbohydrate intake was high and the fat intake low. Calcium consumption was below Sherman's standard, although increased by the use of wheat and during seasons when larger amounts of milk and cheese were eaten by the peasants. Phosphate and iron intake was found to be adequate. Vitamin A was supplied by using yellow corn. While the diet was poor in vitamin D, these people spent much of their time outdoors. The diet was rich in B_1 and deficient in B_2. Vitamin C was supplied probably in sufficient amounts by the use of small quantities of green and root vegetables.

The analysis of the food consumed by the 22 families shows a typical pellagra-producing diet, especially during the pre-Christmas fast and Easter Lent. The outstanding features were the large amounts of corn used, deficiency of vitamin B_2, calcium and protein of good biological value, and the small intake of green vegetables and milk.

TEXTILES AND CLOTHING

The acid degradation of wool keratin, M. Barr and R. Edgar (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 129–134, figs. 2*).—Continuing previous work (E. S. R., 75, p. 139), the authors describe the method of measuring the effect on wool keratin after immersion in from 0.25 to 7.87 N hydrochloric acid for 10 hr. at 25° C. and in from 0.25 to 0.75 N hydrochloric acid and from 0.06 to 0.7 N sodium hydroxide for 1 hr. at 100°, the results being judged by determining the weight, nitrogen and sulfur contents, and the wet breaking strength of the residual wool. The acid degradation was found to be much greater at 100° than at 25°, with a decrease in the nitrogen content and a very slight change in the sulfur content. As the concentration of the acid was increased, the nitrogen content decreased and the sulfur content gradually increased in the residual wool. The wet breaking strength decreased approximately 85 percent after immersion in hydrochloric acid for 1 hr. at 100°, with a similar decrease of approximately 45 percent after immersion for 10 hr. at 25°.

The acid and alkaline degradation of chlorinated wool, F. and M. Barr and R. Edgar (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 145–150, figs. 3*).—Continuing the above study, the authors present data on the effect of dilute acid and alkali on chlorinated wool. Samples were treated with from 0.5 to 6 N

hydrochloric acid for 10 hr. at 25° C., with from 0.25 to 0.75 N hydrochloric acid for 1 hr. at 100°, and with from 0.05 to 0.2 N sodium hydroxide for 10 hr. at 40°. The chlorinated wool showed greater degradation by acid in 10 hr. at 25° than was exhibited by the untreated wool. Comparing the wet breaking strengths of the residual wools, the chlorinated wool decreased approximately 90 percent and the untreated wool decreased approximately 85 percent after immersion in hydrochloric acid for 1 hr. at 100°. The nitrogen content and the weight of the chlorinated wool showed the greatest loss in the sodium hydroxide for 10 hr. at 40°, with approximately the same amount of sulfur being dissolved out from both samples of wool. The wet breaking strength of the chlorinated wool was completely destroyed in 1 hr. at 40° by 0.05 N sodium hydroxide. Increasing the concentration of acid or alkali decreased the nitrogen and sulfur contents of the residual chlorinated wool.

Alkaline degradation of wool keratin, M. Barr and R. Edgar (*Textile Res., 6 (1936), No. 6, pp. 273-277, figs. 3*).—In this study, conducted at Iowa State College, the authors discuss the effect of from 0.02 to 0.25 N sodium hydroxide on wool. The tests were conducted at temperatures of 25°, 40°, and 55° C. and were continued through a 10-hr. period. Increasing the concentration of the alkali resulted in a decrease in sulfur content and an increase in the nitrogen content of the residual wool, the ratio of dissolved : residual sulfur became greater, and the weight of the wool decreased. Increasing the temperature had a similar effect on the sulfur ratio and the weight of the wool, causing a decrease in the sulfur : nitrogen ratio.

The degradation of silk, wild silk, and wool by steam, E. C. Walde, M. Barr, and R. Edgar (*Textile Res., 6 (1936), No. 5, pp. 235-240, figs. 2*).—In this experiment, conducted at Iowa State College, samples of silk fibroin, wild silk fibroin, and wool keratin were subjected from 1 to 3 hr. to the action of steam in an autoclave under pressures ranging from 0 to 75 lb. Chemical analysis and tests to determine the wet warp, breaking strength, and elongation at the breaking load were made. The results indicate that the fibrous structure is broken down before the soluble degradation products are formed. The degradation process is increased with increasing time or pressure, being greatest for the wool keratin and followed, respectively, by the wild silk fibroin and the silk fibroin.

Clothing: Selection and care, M. L. Matthews (*Boston: Little, Brown & Co., 1936, pp. XIII+407, pls. 2, figs. 137*).—The author states that the purpose of this book is to stimulate an appreciation of artistic and hygienic dress, a desire to understand the economic problems and consumer-buyer relationships, a willingness to care efficiently for clothing, and good standards for the selection of clothing. The book is organized on the unit basis and is intended for use in senior high school classes in clothing. Each unit is followed by suggestions for problems and activities and a list of references. The firms from which exhibits and pamphlets can be obtained, in addition to further references, are listed.

HOME MANAGEMENT AND EQUIPMENT

Consumption and standards of living, C. C. Zimmerman (*New York: D. Van Nostrand Co., 1936, pp. XVI+602*).—This is a comprehensive presentation of the subject, based in part upon early and current literature and in part upon investigations conducted in many parts of America, including Canada, Cuba, and the United States, and in Siam. Chapters included deal with the problem of consumption, the fields of desire, laws of consumption, the role of food, the laws of food, food behavior under minimum conditions, the role of housing, laws of housing expense, housing and the family, the role of clothing, the laws of

clothing expense, sundries and advancement, spending or saving, spending for prosperity, early studies, modern studies, the Le Play school, the Russian school, American studies—then and now, classical economic theory and consumption, institutional theory and consumption, Austrian hedonism and consumption, mathematical hedonism and consumption, and the nature of a system of living.

Scientific consumer purchasing (*Washington, D. C.: Amer. Assoc. Univ. Women, [1935], rev. ed., pp. 64*).—This is "a study outline on problems of the consumer in making intelligent selections and recent developments in production and distribution which affect the consumer's interest." Part 1 outlines plans and gives references for the use of groups in studying advertising, the salesman, and testing laboratories as sources of consumer information; brands and trademarks, grades and specifications, and labels as aids in buying; and consumer purchasing and planned production. Part 2 includes outlines for special studies of hosiery, blankets, sheets and sheeting, refrigerators, canned foods, terms used in designating grades and qualities of commodities, and legal safeguards for food, drugs, and cosmetics.

Alt's house heating plans, H. L. ALT (*Chicago: Dom. Engin. Co., 1936, pp. V+208, figs. 100*).—Technical information is presented on the subject in this handbook, which includes especially data on the design of heating systems.

MISCELLANEOUS

Yearbook of Agriculture, 1936, H. A. WALLACE ET AL. (*U. S. Dept. Agr. Yearbook 1936, pp. [8]+1189, figs. [262]*).—This contains The Secretary's Report to the President (pp. 1–117) (E. S. R., 74, pp. 289, 732); a comprehensive discussion of Better Plants and Animals, including 22 special articles noted elsewhere in this issue; and statistics noted on page 124.

Arizona's farm problems: Forty-sixth Annual Report [of Arizona Station], 1935, P. S. BURGESS (*Arizona Sta. Rpt. 1935, pp. 104, figs. 7*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue. Meteorological observations are also reported.

Forty-eighth Annual Report of [Kentucky Station], 1935, I, II, T. P. COOPER ET AL. (*Kentucky Sta. Rpt. 1935, pts. 1, pp. 70; 2, pp. [3]+276, figs. 58*).—Part 1 includes the report of the director, the experimental work referred to and not previously noted being for the most part abstracted elsewhere in this issue. Part 2 contains reprints of Bulletins 356–361, previously noted.

Forty-eighth Annual Report [of Tennessee Station], 1935, [C. A. MOOERS ET AL.] (*Tennessee Sta. Rpt. 1935, pp. 51, fig. 1*).—The experimental work reported is for the most part noted elsewhere in this issue.

Abstracts of Bulletins 503–522, Circulars 73–76, and other publications during 1935, A. D. JACKSON (*Texas Sta. Circ. 78 (1936), pp. 30*).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere. For the most part these are either previously noted or abstracted elsewhere in this issue.

NOTES

Arizona University and Station.—Dr. Paul S. Burgess, acting president since June 1, has been appointed president of the university, beginning October 28, 1930. Dr. R. S. Hawkins has been appointed acting dean of the College of Agriculture and director of the experiment station, beginning November 1.

California University and Station.—Dr. Hugh S. Cameron has been appointed assistant professor of veterinary science and assistant veterinarian at Davis.

Kentucky Station.—Dr. Robert N. Jeffrey has been appointed plant physiologist for a study of chemical processes involved in tobacco curing.

Minnesota University and Station.—The station is cooperating with the U. S. D. A. Bureau of Plant Industry and the State Department of Agriculture in weed research. This project will cover all types of noxious weeds, but efforts are now being concentrated upon field bindweed. A 160-acre farm near Lamberton, thoroughly infested with this pest, has been rented for a 5-year attack on various problems of control. The portion of the farm not in plats is being operated much as could be done by a farmer confronted with the weed problem.

Dr. H. B. Bull, assistant professor of agricultural biochemistry and assistant agricultural biochemist, resigned August 1 to accept a position as assistant professor of physiological chemistry in the Northwestern University Medical School. Dr. David R. Briggs, assistant professor of chemistry and assigned to the Otho Sprague Memorial Research Institute at the University of Chicago, has been appointed associate professor of agricultural biochemistry and associate biochemist.

Thomas H. Canfield has been appointed instructor in poultry husbandry and assistant poultry husbandman.

Dr. Ernest G. Anderson, associate professor of genetics in the California Institute of Technology, is to spend the winter quarter at the station as visiting associate professor, advising regarding the genetic research program and assisting in graduate teaching in the College of Agriculture.

Nebraska Station.—Two greenhouses, 28 by 100 ft., with brick head houses, have been erected and will provide additional space for agronomic work. Brick head houses have also been completed for the old greenhouses, the new facilities including a laboratory for horticulture.

Nevada Station.—Dr. J. E. Church, meteorologist of the station, has been appointed collaborator in the U. S. D. A. Bureau of Agricultural Engineering. The method of snow surveying originated and perfected by the station has been adopted by the Bureau, which is now organizing a Federal system of snow surveys in cooperation with the experiment stations of the Western States.

Efforts begun in 1929 to obtain a soil penetrating type of phosphorus carrier capable of permeating the soil layer below the plow line have resulted in finding in the phosphoric esters of various polyhydric alcohols and their salts materials which escape the fixation in insoluble forms which often occurs in the phosphatic fertilizers commonly used. The phosphorus in these compounds has also been found to possess unusually good chemical availability.

Virginia Polytechnic Institute.—The research committee of the State Academy of Science has made a small grant to Dr. J. G. Harrar, assistant professor of botany, for a biochemical study of certain nitrogen-fixing bacteria.

Washington College and Station.—Leaves of absence for graduate work have been granted C. L. Vincent, Harry L. Garver, and J. R. Herman, their

respective duties to be taken over by Earl F. Burk of the Oklahoma College and Station as acting assistant professor in horticulture and assistant in vegetable gardening, H. N. Colby of the New Hampshire University and Station as investigator in farm electricity, and Curtis G. Keyes of Cornell University as instructor in landscape gardening and floriculture. R. E. McCall has resigned as instructor in animal husbandry and assistant animal husbandman to accept a similar position in the Montana College and has been succeeded by Hector G. McDonald.

West Virginia University and Station.—Dr. Lawrence P. Batjer, associate horticulturist at the university farm at Kearneysville, has resigned to accept a similar position with the U. S. D. A. Research Center at Beltsville, Md. Recent appointments include R. S. Marsh, associate professor and associate chief in pomology in the Illinois University and Station, as professor of horticulture and horticulturist, vice Dr. H. E. Knowlton resigned, E. C. Weitzell and M. A. Abrahamen as assistant farm economists, J. L. Cartledge as assistant professor of genetics, E. A. Marten as assistant professor of bacteriology, E. P. Brasher as instructor and assistant in horticulture, and W. C. Brown as instructor and assistant in dairy husbandry.

Moscow Laboratory of Climate.—A recent issue of *Science News Letter* reports that there has been established in Moskva (Moscow), under the direction of S. L. Bastyamov, a climatic laboratory in which seasons of the year, summer and winter temperatures, calm weather and winds, humidity, and drought are reproduced under very accurately controlled conditions. "Air is cooled in huge refrigerators, heated in electric furnaces, has its humidity controlled, and is given different velocities in imitation of wind. The reproduction of natural conditions is very accurate." Among problems being studied are snow retention on the soil and in drifts and protection against drifting; reaction of crops, especially wheat, to frost, heat, and drought; behavior of lubricants under different climatic and weather conditions; factors affecting the measurement of humidity and wind velocity; responses of various kinds of fabrics to atmospheric conditions; and adaptation of clothing to weather conditions and different kinds of use.

New Journals.—*Die Ernährung* is being published quarterly in Berlin as a journal for promotion of research, teaching, and improved practice in nutrition. The initial number contains among other material abstracts and book reviews and the following original articles: The Problem of Nutrition Research in Germany, by O. Flössner (pp. 12–18); The National Agencies Concerned With the Food Supply: Their Establishment and Problems, by H. Ertel (pp. 19, 20); The Relation Between Animal and Human Nutrition, by E. Mangold (pp. 21–25); Likenesses and Differences in the Vitamins, by W. Stepp (pp. 26–31); Fundamentals of the Protein Minimum and Optimum, by K. Felix (pp. 31–35); and The Biology of Plants in Relation to Human Nutrition, by E. Lehmann (pp. 36–42).

Archivo Fitotécnico del Uruguay is being published by the National Phytotechnical and Agronomic Institute at La Estanzuela. The initial number contains a bibliography of the publications of the institute since its establishment in 1912 and the following original articles: Genetics in Relation to the Most Efficient Plants, by A. Boerger (pp. 13–31); Studies on *Tilletia* and Related Problems, by J. G. Dellazoppa (pp. 32–62); The Baking of Maize, by J. Belmonte Freixa (pp. 63–70); Crop Rotation and Weeds in La Estanzuela, by A. A. Bonjour (pp. 71–80); Biological Selection in the Soybean, by T. Henry (pp. 81–91); Inoculation of Soybeans With Artificial Cultures of *Bacillus radicicola*, by M. Canel (pp. 92–99); and The Value of Lin Calel Wheat for the Improvement of Uruguay Flours, by J. Belmonte and G. J. Fischer (pp. 100–

134). A feature of the publication is its requirement of abstracts of each article in a second language, preferably English or German.

Enzymologia is being published at 's Gravenhage (The Hague) at approximately monthly intervals as an international journal for enzyme research. It will deal only with original papers in English, French, German, and Italian. Among those in the initial number are Variations in the Phosphomonoesterase Content of the Milk of the Cow in Relation to the Progress of Lactation, by S. J. Folley and H. D. Kay (pp. 48–54); The Specificity of Urease, by R. Bonnet and R. Razafimahery (pp. 55–59); and The Inactivation of Phosphatase, by S. Herschdörfer (p. 96).

Microentomology is being published from time to time by the Natural History Museum of Stanford University. It will contain only papers based on work which is in some way associated with the museum, and a distinctive feature will be the utilization of the newer photographic methods of reproduction because of their special adaptability to the printing of figures. The initial issue is entitled Contributions to the Knowledge of the Coccoidea (Homoptera), by G. F. Ferris (pp. 2–16).

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 3, the following section officers were elected at the Houston meeting, November 16–18, 1936: Agriculture, R. L. Watts of Pennsylvania, chairman, William Peterson of Utah, vice chairman, and H. H. Kildee of Iowa, secretary; engineering, F. C. Bolton of Texas, chairman, and G. W. Case of New Hampshire, secretary; and home economics, Flora Rose of New York, chairman, and Statie E. Erikson of Kentucky, secretary. In the section of agriculture, the subsection of experiment station work elected C. E. Ladd of New York, chairman, and C. L. Christensen of Wisconsin, secretary; the subsection of extension work, J. R. Hutcheson of Virginia, chairman, and L. R. Simons of New York, secretary; and the subsection of resident teaching, V. C. Freeman of Indiana, chairman, and P. W. Chapman of Georgia, secretary.

Although some reappointments of committee members whose terms had expired were made, the general policy was that of a change of personnel. On the committee of college organization and policy, M. G. Neale of Idaho and C. E. Friley of Iowa succeeded A. G. Crane of Wyoming and A. A. Hauck of Maine. On instruction in agriculture, Cornelius Betten of New York and L. J. Horlacher of Kentucky were appointed vice D. T. Gray of Arkansas and E. J. Iddings of Idaho; on instruction in engineering, F. E. Johnson of Missouri and Paul Cloke of Maine vice M. L. Enger of Illinois and O. J. Ferguson of Nebraska; on instruction in home economics, Mary L. Matthews of Indiana vice M. Marie Mount of Maryland; on experiment station organization and policy, R. E. Buchanan of Iowa and J. C. Kendall of New Hampshire vice L. E. Call of Kansas and B. E. Gilbert of Rhode Island; on extension organization and policy, Blanche L. Lee of Wisconsin vice Kathryn V. Burns of Illinois; on military organization and policy, H. C. Byrd of Maryland vice E. M. Lewis of New Hampshire for 3 years, and C. W. Pugsley of South Dakota vice H. L. Kent of New Mexico for 1 year; on engineering experiment stations M. L. Enger of Illinois vice A. A. Potter of Indiana; on radio, Ray Fife of New Mexico for 1 year vice R. M. Hughes of Iowa; and on the joint committee of projects and correlation of research, Fred Griffee of Maine vice F. B. Mumford of Missouri.

A new standing committee on graduate work was created, consisting of W. J. Robbins of Missouri, chairman, W. W. Pierson of North Carolina, C. O. Appleman of Maryland, C. W. Hungerford of Idaho, and W. C. Russell of New Jersey.

EXPERIMENT STATION RECORD

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RESEARCH AT THE HOUSTON CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

Four main topics were under discussion by the experiment station subsection of the Association of Land-Grant Colleges and Universities at the Houston convention (E. S. R., 76, p. 1). These topics were essentials for further progress in agricultural research, the scope and objectives of agricultural economic research, the use of Bankhead-Jones funds to promote a coordinated program of research between the States in cooperation with the U. S. Department of Agriculture, and professional improvement for the experiment station staff. Considerable of direct interest was also afforded in the reports of the various committees and elsewhere in the association program, notably in a paper by Dean E. M. Freeman of Minnesota on Projects—Benign and Malignant—and in a round table discussion in the home economics section on important implications of cooperative research.

The outstanding research development of the year was the beginning of work under the Bankhead-Jones Act, and the discussion as to the use of the additional funds thereby provided for promoting a coordinated program of research was especially opportune. In his opening statement, Dr. J. T. Jardine, chief of the Office of Experiment Stations, brought out the facts that while this fund will amount in 1937 to only approximately 6 percent of the total available to the State stations and the Department, and that in consequence its most effective use will be in conjunction with other funds, some 360 projects have been formulated and approved under the allotments to the States, 3 regional laboratory projects (E. S. R., 75, p. 1) have been approved and established, and 36 special research projects have been approved under the special fund available to the Federal Department of Agriculture. He discussed the principles of coordination as followed in these various undertakings, citing as points to be kept in mind the importance of developing the findings of our research to a point where they can be applied by other agencies, the selection of problems really suited to a coordinated program, and the full utilization of physical plants and equipment, existing knowledge, and a trained, experienced research personnel. He concluded

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as follows: "Personally, I feel that we have made a good start under the Bankhead-Jones Act, and I am confident of progressive development during the next few years. The spirit of cooperation is excellent among both administrators and research workers of the State stations and the Department. Constant effort is necessary, however, to take advantage of this spirit of cooperation and work out ways of coordinating our far-flung investigations without spending an unwarranted amount of time away from the actual individual research. After all, we must have effective research by the individual workers or we may have a coordinated plan without results."

The discussion of this topic by Director S. W. Fletcher of Pennsylvania commended the policy of the Department in enforcing the act whereby there has been set up in preference to exacting regulations "principles or goals toward which the stations may work as rapidly as is practicable." In his opinion, the regional laboratories "may be expected to represent Federal-State relationships at their best," and he stated that this aspect appears to be progressing satisfactorily. The situation as regards coordination between the State experiment stations without the participation of the Department, however, he found somewhat less encouraging. Emphasizing the need for greater concern in this coordination, he also drew attention to "the other and even more important administrative responsibility, which is to seek out and to encourage those individuals who are most productive in research, whether they happen to have the cooperative spirit or not." Moreover, he reminded the subsection, "it is quite possible, as most directors have discovered, for the clear note of productive research to be drowned out by the clank of administrative machinery. This danger will be imminent in the larger program of coordination which we seek to promote."

The paramount importance of the individual investigator was also recognized in the discussion of the question of professional improvement for the station staff. The paper of Director E. P. Sandsten of Colorado was primarily a frank and sympathetic exposition of the responsibilities of the institutions and their directors to promote efficiency, peace of mind, and mental growth. Director J. C. Kendall of New Hampshire took up some of the more intangible factors in a human problem of this sort, likening these elements to the vitamins in the field of nutrition. An ensuing discussion became virtually a round table, with an exchange of views and the presentation of a wide variety of specific suggestions.

One of the most comprehensive and constructive papers of the convention was the discussion by Director C. B. Hutchison of California on essentials for further progress in agricultural research. Taking up in turn the status of research as regards soils, plants,

animals, and the social sciences, he pointed out existing weaknesses and suggested means for their amelioration. In conclusion he expressed the conviction that "the first essential for further progress in agricultural research lies in renewed and continued efforts to strengthen basically the experiment station staffs. This is a never-ending process if the station is to grow, not necessarily in numbers of workers, laboratories, and buildings but in the scientific stature and scholarship of its staff. Fortunately, new and young investigators are entering most, if not all, fields of agricultural research with equipment in scientific training far superior to that of most of us older people. . . . Care in the initial selection of these young men, special efforts to develop those of larger vision and ability, as much freedom as possible from routine or even directed research, encouragement to seek important scientific contacts in their own and collateral fields—all of these things and others cannot but result ultimately in an increased efficiency in the experiment stations' work."

The scope of research in agricultural economics was considered by Director C. L. Christensen of Wisconsin in relation to projects dealing with (1) the practices of the individual farmer upon his farm, (2) the effect of legislative measures upon the economic and social welfare of agriculture, and (3) the interdependence and relationships of farmers with other groups of society. A need for more fundamental studies on all three phases was indicated, together with a belief in the importance of closer coordination of the economic and biological sciences. "Too long", he said, "have we administrators permitted the economist to stand apart from the other work of the experiment station. Too long have the economists considered themselves to be working upon something complete in itself. And too long has the physical and biological scientist been permitted to look upon the work of the economist as something disassociated with his activities."

More effective coordination, encouragement of the individual investigator, and a policy of concentration on a few essential projects as opposed to a scattering of energies and resources may be considered the dominant notes in the research discussions. None of these were new matters, yet the program was in no sense a scratching over of old straw. There was little glorification of past achievements, and the applications were directly to existing conditions. The outlook was notably forward looking, an indication of a desire and purpose to do an already good job even more effectively. This attitude and viewpoint should do much to strengthen and sustain the new programs which are being formulated as increased resources are again becoming available.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The isolation from cottonseed oil of an alcohol resembling alpha tocopherol from wheat-germ oil, O. H. and G. A. EMERSON and H. M. EVANS (*Science, 83 (1936), No. 2157, p. 421*).—A brief note from the University of California reports the isolation from cottonseed oil of four allophanates, of which one, melting at from 158° to 160° C., appeared identical with the allophanate prepared from an alcohol obtained by the authors from wheat-germ oil and designated "α-tocopherol."

The two compounds have the same melting point, there is no depression in mixed melting points, both compounds exhibit a maximum absorption in the ultraviolet between 2,900 and 3,000 a. u., and the alcohols regenerated from them show similar biological activity. The substance designated α-tocopherol was found to have the properties of vitamin E.

Carbohydrates in Irid[aea] laminarioides (Rhodophyceae), W. Z. HASSID (*Plant Physiol., 11 (1936), No. 2, pp. 461–463*).—At the University of California plants of *I. laminarioides* were collected at four different times of the year, extracted with alcohol, and analyzed for soluble sugars. No free-reducing or total sugars were found. On concentrating the alcoholic extract, however, a crystalline substance was obtained, which was identified as the sugar alcohol dulcitol. There was also obtained a new carbohydrate, insoluble in alcohol. The author proposes for the new carbohydrate a structural formula which may be partially represented in the form

$$[-\overbrace{CH\cdot HCOH\cdot HOCH\cdot HCO}^{O}\cdot CH\cdot CH_2\cdot OSO_2\cdot ONa]_n,$$

in which n appeared to be approximately 6.

Starch was found, but "the plant does not contain any cellulose, and, since the content of galactan is about 40 percent of its dry weight and constitutes the main bulk of the plant, it appears that this substance plays the same part in building up its cell wall as does . . . cellulose in the higher plants."

Role of phosphoglyceric acid in the dissimilation of glucose by the propionic acid bacteria, R. W. STONE and C. H. WERKMAN (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 341–343*).—At the Iowa State College phosphoglyceric acid was isolated from the cultures of three distinct species, *Propionibacterium shermanii*, *P. arabinosum*, and *P. pentosaceum*, in a medium containing added sodium hexosediphosphate, and from a culture of *P. pentosaceum* in a medium containing a phosphate buffer solution but none of the hexosediphosphate. On purification, the phosphoglyceric acid obtained was found to be the same as that isolable from yeast.

"It may be objected that the formation of phosphoglyceric acid by bacteria in the presence of toluene does not prove the acid to be a normal intermediary in the dissimilation of glucose. However, its isolation does indicate that the propionic acid bacteria at least possess the necessary enzyme equipment for its

formation. Furthermore, the evidence is clear that the break-down of glucose may occur by way of phosphoglyceric acid."

Methylene blue reduction and oxidation-reduction potential studies on members of the colon-aerogenes group of bacteria, S. S. EPSTEIN (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 303–316, figs. 5*).—The ability of 24-hr. lactose broth cultures to reduce methylene blue was tested at the Iowa State College on 359 strains of the colon-*aerogenes* group of bacteria.

Potentiometric studies on 45 strains showed that the potentials (Eh) developed by 24-hr. lactose broth cultures were definitely positive with all of the *Escherichia* strains (7) tested, but were not negative with all of the *Aerobacter* cultures (34). In 12 instances the potential measurements did not parallel the results of the dye reduction, "indicating that methylene blue in the concentration used cannot be regarded as a reliable indicator for detecting oxidation-reduction potentials developed in bacterial cultures." On the other hand, all *Aerobacter* strains forming typical *A. aerogenes* colonies on eosin methylene blue agar and over 90 percent of the *Aerobacter* strains which formed bluish mucoid colonies on the same medium gave positive methylene blue reduction tests and produced decided negative oxidation-reduction potentials in 24-hr. lactose broth cultures. "Eosin methylene blue agar, therefore, is a good index, and a much easier one than the others for indicating how the strains in question will behave in lactose broth with respect to development of oxidation-reduction potential."

A quantitative study of fluorine distillation, D. DAHLE and H. J. WICHMANN (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 2, pp. 313–320, figs. 4*).—A study of the various factors influencing the recovery of fluorine by the Willard and Winter distillation process (E. S. R., 69, p. 489) is here reported from the U. S. D. A. Food and Drug Administration.

"Quantitative expressions are given to the effects on recovery of such factors as (1) the amount of nonvolatile acid used in the distilling flask, (2) the temperature at which the distillation is carried out, (3) the amount of distillate collected, (4) the size of flask used, and (5) the presence of some retarding influences such as aluminum salts and gelatinous silica."

These data were applied to the development of a rapid, semiquantitative test and to the problem of increasing the sensitivity of the fluorine determination for very small quantities.

The determination of fluorine in the presence of a large excess of aluminum ions, D. DAHLE and H. J. WICHMANN (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 2, pp. 320–327, figs. 4*).—Having confirmed, in the work noted in the preceding abstract, the retarding influence of aluminum salts mentioned by Willard and Winter (E. S. R., 69, p. 489), the authors proceeded to a study of the separation of small quantities of fluorine from large amounts of aluminum. It was found that for complete separation by distillation the usual procedure is not satisfactory. Distillation at higher temperatures or the collection of increased amounts of distillate was shown to be necessary.

The effect of various other factors influencing fluorine recovery was also studied, and a method for isolation of fluorine occurring as an impurity in aluminum sulfate and alums is suggested.

A multiple-unit distilling apparatus for determination of fluorine by the Willard and Winter method, D. S. REYNOLDS, J. B. KERSHAW, and K. D. JACOB (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 1, pp. 156–162, figs. 2*).—With the apparatus here described, 6 distillations can be made simultaneously, and 24 determinations could be completed in 8 hr. The performance of the apparatus on typical samples of phosphatic materials is indicated. The apparatus has

been in use for nearly 1 yr., without requiring any repairs, with a use in approximately 1,500 distillations.

A new method for the determination of iodine, D. R. McCullagh (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 35–44, fig. 1*).—The sample is subjected to alkali digestion, further oxidation in a muffle furnace at a maximum temperature of 360° C., and distillation from a strongly acid solution in the presence of oxidizing agents. The iodine is finally titrated with 0.001 N sodium thiosulfate.

The author finds it possible to complete the determination of iodine in a blood sample in 3 hr. and to handle several determinations simultaneously.

***Blood iodine studies.*—IV, The clinical determination of iodine in blood, urine, and feces,** F. J. Phillips and G. M. Curtis (*Amer. Jour. Clin. Path., 4 (1934), No. 4, pp. 346–353*).—The authors of this contribution from the Ohio State University describe in detail a procedure which, for the best results, must be "followed meticulously and . . . carried out in the minimum amount of time." In the case of blood samples, 10-cc portions are treated each with 10 cc of saturated, iodine-free potassium hydroxide solution in a thoroughly cleaned nickel crucible, the mixture is boiled to effect thorough hydrolysis of the proteins, and the mass is ashed under carefully specified conditions at 400° C. The water-soluble salts are extracted and filtered, the solution is evaporated to dryness, the iodine salts are extracted with iodine-free 95 percent alcohol, the alcoholic solution is evaporated to dryness, the extracted salts are taken up in iodine-free distilled water, the pH value is adjusted to about 4 with 0.05 M hydrochloric acid and methyl orange (a very dilute solution of the indicator), the iodine is set free by means of chlorine water, the excess chlorine is carefully boiled out, and the iodine is titrated with 0.001 N sodium thiosulfate solution from a microburette, the usual starch indicator being used.

Dithizone methods for the determination of lead, P. A. Clifford and H. J. Wichmann (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 1, pp. 130–156, pls. 4, figs. 11*).—Extending their previous investigations (E. S. R., 75, p. 301), the authors report modifications of procedure which increase both the sensitiveness and the precision of "dithizone" (diphenylthiocarbazone) methods for the determination of lead and their adaptation to various materials. Some physical properties of dithizone and the mechanism of the lead dithizone reaction are discussed. Dithizone methods are classified, and certain inherent errors are indicated. The "mixed-color" dithizone method, previously applied only to the determination of lead as spray residue on fruits, is modified to make it more generally applicable. A photometric method of measuring the color, which increases the sensitivity and accuracy of dithizone methods for lead, is presented, and the nature of the apparatus required is indicated. The accuracy of the method is illustrated by results obtained on several foods and on biological materials.

A reagent for the elimination of the influence of high ammonia concentrations upon the potash results in short chemical soil tests, W. R. Kenny and J. B. Hester (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 682, 683*).—Ethyl alcohol was found more satisfactory than methyl or isopropyl alcohol as precipitant for the cobaltinitrite complex. A distinct interference by the larger concentrations of ammonia nitrogen in soil extracts was observed, but the addition of 2 cc of 37 percent formaldehyde, in place of 2 cc of the alcohol or in addition to the usual quantity of alcohol, "completely ties up the ammonia and prevents its precipitation when the alcohol is added. . . . Since ammonium salts combine with formaldehyde to form hexamethylenetetramine,

it removes the ammonia from the solution sufficiently well to prevent it from interfering with the short chemical tests as they are normally conducted."

A new apparatus for carbonic acid estimations in soils, B. N. SINGH and P. B. MATHUR (*Soil Sci., 41 (1936), No. 6, pp. 433–441, pl. 1, figs. 3*).—A manometric apparatus for the estimation of carbonic acid in soils is described. The use of rubber connections, which are considered to be likely to cause errors in various ways, has been avoided and an effective mixing of reactants rendered practicable. Because of its detachable nature, the reaction bulb is easily shaken by hand, and no shaking apparatus is required. The reaction bulb, which is made in two parts connected by a ground-glass joint lubricated and sealed with anhydrous lanolin, is so constructed that it is sealed gastight by the act of turning the acid-containing arm of the vessel in the ground-glass joint to permit the acid (diluted hydrochloric) to flow into the part of the vessel containing the soil sample. After shaking for from 4 to 5 min., the reaction vessel is again joined to the manometric part of the apparatus by the lubricated and sealed ground-glass joint through which the carbon dioxide pressure can be released to the manometer by turning the acid-containing part of the reaction vessel back to its original position, so that two openings through the walls of the reaction-vessel joint coincide with one another and with the connection to the manometer. The main portion of the apparatus is enclosed in a water jacket in which the water may be stirred by an air current from a rubber bulb.

A simplified calculation, applicable with sufficient accuracy when the area of the cross section of the manometer tube is less than 0.75 mm^2, is shown, and figures indicating the accuracy of the determination as actually carried out are given. The deviation from the mean value was found to be ± 1.25 percent of the total carbon dioxide determined.

Data obtained from a large number of samples from a piece of land 140 by 100 ft. indicated a wide variation in the carbonate content of portions of the soil separated by very short distances. "This field was divided into 35 plats 20 by 20 ft., each of which was again subdivided into 25 subplats 4 by 4 ft. each. Borings were made about the center of the ultimate plats, and the samples were analyzed for carbonate CO_2. The points at which the carbonate content was 4, 8, or 12 percent below or above the mean value for the whole field were joined", and a contour map was constructed. "Generally speaking, variations in the carbonate content may exist from one corner of the field to another corresponding roughly with the line of slope or as random patches of higher or lower carbonate content. From the topography of the field under observation it became evident that most of the variations in carbonate content could be attributed to the leaching action of water. The occurrence of random patches of higher or lower carbonate content suggested that considerable errors might be introduced in the results of varietal tests or in the response of varieties to different manurial treatments due to this type of soil heterogeneity."

A convenient resistance for determination of redox potentials in biological fluids, M. E. FREEMAN (*Science, 83 (1936), No. 2162, p. 562, fig. 1*).—A brief contribution from the University of Maine calls attention to the fact that "a discouraging source of error in the measurement of redox potentials in many biological fluids is the rapid polarization of the cell. The obvious remedy, high resistance in the galvanometer circuit, has been adopted in most laboratories. Many of these devices are inconvenient to manipulate or to assemble. The writer has found that a series of radio grid leaks (or resistors) con-

nected to a multiple point switch allowed a rapid adjustment of the potentiometer with a minimum flow of current from the cell." The series illustrated consists of resistors adding successively 25, 25, 50, 100, 100, 200, 500, and 1,000 units of resistance, each unit being 10^4 ohms. Cutting down the resistance until the minimum current for the deflection of a sensitive galvanometer was obtained, balancing the system, and repeating this procedure step by step until the system was balanced with all resistance cut out kept the current drawn and the polarization of the cell to the minimum. It is noted that "the values of the unit resistors need not be accurately known, since they are not concerned in the final measurement."

Adaptation of the micro-Kjeldahl method for the determination of nitrogen in plant tissues, N. W. Stuart (*Plant Physiol., 11 (1936), No. 1, pp. 173–179*).—The micro-Kjeldahl method used by the author of this contribution from the Maryland Experiment Station is described, in part, as follows:

"About 25 mg of dry plant tissue were weighed [on a Kuhlmann microchemical balance] in a Coors porcelain boat. Boat and contents were transferred to a microdigestion tube and digested with 1 ml of low nitrogen concentrated H_2SO_4 and a few milligrams of 3:1 $CuSO_4$–K_2SO_4 mixture. When the solution was partially clear, 2 or 3 drops of Merck's reagent Superoxol (30 percent hydrogen peroxide) were added and the digestion completed. The acid digest was diluted with 1 ml of ammonia-free water and washed into the distillation apparatus." After the addition of 7 ml of 30 percent NaOH containing 5 percent $Na_2S_2O_3$, "the mixture was distilled with steam for 5 min. The ammonia was collected in 10 ml of 0.01 N H_2SO_4. Distillates were boiled and titrated with 0.01 N NaOH to a methyl red end point. The indicator, introduced by means of a glass thread, was prepared by adding an excess of methyl red to 0.1 N NaOH. Acid and base were measured in 10-ml microburettes. The apparatus was steamed for 30 min. before each series of determinations. Blank determinations amounted to 0.05 to 0.06 ml of 0.01 N NaOH.

"The nitrogen content of 2-ml aliquots of the nonprotein extracts was determined by the micro-Kjeldahl method. The nonprotein extracts were first concentrated in vacuo to a volume such that 2 ml contained 0.3 to 0.5 mg or more of nitrogen. Basic nitrogen precipitated by phosphotungstic acid was determined as the difference between nonprotein and nonbasic nitrogen. The filtrate from the basic nitrogen was neutralized with NaOH, acidified with acetic acid, and concentrated in vacuo to the original volume of the aliquot precipitated with phosphotungstic acid. Aliquots of 2 ml of this basic-free solution were analyzed for nitrogen content by the micro-Kjeldahl method. Aliquots of 5 ml of the nonprotein extracts were hydrolyzed in microdigestion tubes with 0.3 ml of concentrated H_2SO_4 under reflux condensers for 2.5 hr. The solutions were washed into the distillation apparatus and distilled with 2.4 ml of 30 percent NaOH for 5 min."

Diagnosis of plant troubles with diphenylamine, L. H. Jones (*Plant Physiol., 11 (1936), No. 1, pp. 207–209*).—This contribution from the Massachusetts Experiment Station very briefly points out certain possibilities of Morgan's diphenylamine reagent (E. S. R., 67, p. 105) for the detection of nitrates in plant tissues.

"Testing for nitrate when the source of nitrogen is from the ammonium ion has given some interesting results even though it is difficult to make a comprehensive interpretation of them. There have been times when, in a 24-hr. period, ammonium sulfate applied to the soil gave positive tests for nitrate in the plant equal to those obtained from sodium nitrate. At other times positive

tests were not obtained until 3 days after the ammonium sulfate was applied. . . . Some tests and observations tend to support a hypothesis that there is a photochemical or heliochemical effect which, acting with the aid of plant cells, may cause a transformation of the ammonium to the nitrate ion. There are times when it appears as though sunlight initiates this transformation. At other times it appears that the plant part cannot utilize the ammonium ion at the time being, and therefore some mechanism transforms it to the less injurious nitrate form."

Chlorophyllometry, L. H. Roddis (*Plant Physiol., 11 (1936), No. 1, pp. 211, 212*).—A note contributed from the Medical Corps, U. S. Navy, suggests that "the same principles and simple methods used in hemoglobinometry may readily be applied to the measurement of differences in chlorophyll content in plants. . . . The first step required is the establishment of a color standard. The leaf of the common hard maple, *Acer saccharinum*, was selected as readily available. One-third of 1 g of the fresh leaf from the blade, but rejecting the midrib, was taken. This was cut up into fine pieces (3 or 4 mm square) with an ordinary scissors and immersed for 24 hr. in 10 cc of pure alcohol. . . . The alcoholic extract of the chlorophyll was then placed in an ordinary Duboscq colorimeter and compared with a similar extract from the leaf of another plant."

Studies on the quantitative estimation of lignin, I, II (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 2, pp. 341–356, fig. 1*).—These two papers deal with the results of a comparative study of several methods.

I. *Factors affecting the determination by the fuming hydrochloric acid method,* M. J. Goss and M. Phillips (pp. 341–350).—The authors revised the method for determining lignin previously described by Phillips (E. S. R., 67, p. 206), ascertaining the optimum conditions for carrying out this determination, and a detailed description of the revised method and of the necessary apparatus is given.

II. *A comparison of the modified fuming hydrochloric acid method and other methods commonly used,* M. Phillips and M. J. Goss (pp. 350–356).—A comparison was made between the percentages of lignin found in three different samples of wheat straw and spruce wood that had received different preliminary treatments. The authors' method was compared with three other procedures. "Unless the plant material is first successively extracted with an alcohol-benzene solution, hot water, and 1 percent hydrochloric acid before being subjected to the action of the strong mineral acids erroneous lignin values are obtained. The percentage of lignin found by the modified fuming hydrochloric acid method is in all probability a closer approximation to the true lignin content of the plant material than is that found by the other three methods studied."

Colorimetric determination of naringin, E. M. Harvey and G. L. Rygg (*Plant Physiol., 11 (1936), No. 2, pp. 463–465*).—In laboratory studies by the U. S. D. A. Bureau of Plant Industry, it was found that the vinaceous red color resulting from the interaction of naringin and ferric chloride could be used for quantitative colorimetric determinations. The new colorimetric method is rapid and apparently more accurate than that previously employed. The naringin content of one or more samples of fresh tissue can be determined within less than 1 hr. and, if necessary, from samples of fresh tissue as small as 0.1 g. "The most serious objection to the method lies in the fact that the color, after formation, continues slowly to deepen. To overcome this behavior it is necessary to develop uniform manipulation, especially in the timing. Furthermore, the tissue extracts must be relatively free of pigment to allow

satisfactory comparison with the pure standards. The flavedo, but not the albedo, portion of grapefruit rind, offers some difficulty in this respect."

The manipulative detail, involving the use of a Duboscq colorimeter provided with a daylight colorimetric lamp in place of the usual substage mirror, is fully described.

An improvement on the Gross and Smith colorimetric method for the determination of rotenone and deguelin, L. D. Goodhue (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 1, pp. 118–120*).—According to this contribution the colorimetric method for the determination of rotenone and deguelin has been improved in that sulfuric acid has been substituted for nitric acid, the concentration of the alcoholic potassium hydroxide has been reduced by diluting with water, and the nitrite necessary to produce the color is added as sodium nitrite in the alcoholic potassium hydroxide. "The stability, hue, and depth of color produced by the rotenone as well as that produced by the reagents themselves can be easily controlled. This combination of reagents practically eliminates fading and increases the sensitivity of the test 20 times."

Microdetermination of ammonia nitrogen in eggs, S. L. Bandemer and P. J. Schaible (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 3, pp 201–203, fig. 1; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, p. 61*).—A method for the determination of ammonia nitrogen in eggs without aeration is described. The ammonia is absorbed in standard acid from a thin layer of an alkaline solution of the sample. The apparatus consists of a cell made from the top of a Petri dish, in which is centered a glass ring—providing thereby an inner chamber. To the cell is fitted a glass cover. The sample of egg material is placed in the outer chamber and the standard acid in the inner compartment. The ammonia nitrogen is determined by titration after absorption.

Some observations relative to detecting the adulteration of honey with commercial invert sugar, R. E. Lothrop (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 2, pp. 338–341*).—A note contributed from the U. S. D. A. Bureau of Chemistry and Soils calls attention to the fact that color reactions based on the furfural content of invert sugar are not dependable because heating or prolonged storage of unadulterated honey may cause positive color reactions and because invert sugar can be prepared without the formation of reacting substances. Gross adulteration may be detected by the resultant decrease in nitrogen content and ash content. The presence of the acids used in preparing invert sugar (tartaric acid, hydrochloric acid, or phosphoric acid) may also serve to indicate adulteration.

Estimation of vitamin A, A. L. Bacharach, J. C. Drummond, and R. A. Morton (*Nature [London], 137 (1936), No. 3456, pp. 148, 149*).—The authors show that of the three approved methods of estimating vitamin A the values obtained by the spectroscopic method do not agree with those obtained by the biological assay. Direct biological comparison with international standard preparations of carotene is apparently liable to variations of from 20 to 100 percent. The suggestion is made that in the future the subsidiary standard should be accompanied by a statement showing the date at which the biological activity was directly determined and the value of the absorption coefficient at that date. At present it is almost impossible to have workers in different laboratories compare vitamin A estimates unless they use practically identical methods. It is also difficult for the manufacturers to market products of known constant vitamin A content, and this confusion brings discredit upon the use of international units and international standard preparations.

Estimation of vitamin A, E. M. Hume (*Nature [London], 137 (1936), No. 3459, p. 277*).—To prevent the possibility of an incorrect impression concerning

certain decisions on vitamin A made by the 1934 International Conference on Vitamin Standards, arising from the letter written by Bacharach et al. and noted above, the author explains that the decisions made by the conference were considered to be subject to the verdit of experience. The problem regarding the accuracy of the factor 1,600, which was assigned by the conference for application in relating the results of spectroscopic examination and biological tests for vitamin A, is at present being investigated. The possible instability of the cod-liver oil subsidiary standard is also being considered.

On the chemical determination of vitamin C [trans. title], W. A. Dewjatnin and W. M. Doboschenko (*Biochem. Ztschr., 280 (1935), No. 1–2, pp. 118–125*).—The authors find that in none of the various modifications of the method of determining ascorbic acid by titration with 2,6-dichlorophenolindophenol have the procedures followed eliminated the danger of high figures due to the interference of reducing substances other than ascorbic acid.

They propose a new form of the method in which the finely divided material is extracted, under an atmosphere of carbon dioxide, with 5 percent acetic acid solution in place of a sulfuric acid solution, the extract is neutralized to pH 5 by the addition of calcium carbonate, and tannins, proteins, and certain coloring matters are precipitated by means of a 5 percent solution of neutral lead acetate. The authors find their procedure to eliminate the interference of reducing substances except that of hydroquinone and of pyrogallol, and to improve markedly the accuracy with which ascorbic acid may be determined.

On the determination of vitamin C by means of 2,6-dichlorophenolindophenol [trans title], A. Fujita and D. Iwatake (*Biochem. Ztschr., 277 (1935), No. 3–4, pp. 293–295, figs. 2*).—The authors find that extraction of tissues with trichloroacetic acid solutions is a procedure unsuitable for use in the determination of vitamin C, in that ascorbic acid is stable neither in tissue extracts prepared by the use of trichloroacetic acid solutions nor in pure solution in such a reagent. On the other hand, ascorbic acid is very stable in solutions of metaphosphoric acid, any change being hardly detectable even after several days. The indophenol compound is also decolorized to a significant extent by trichloroacetic acid solutions, whereas metaphosphoric acid caused practically none of the last-named error.

On the colorimetric determination of vitamin C [trans. title], A. Fujita, D. Iwatake, and T. Miyata (*Biochem. Ztschr., 277 (1935), No. 3–4, pp. 296–304, figs. 2*).—The authors propose a tungstic acid reduction method.

Reagent 1 consists of 2 g of sodium tungstate (of analytical reagent purity) dissolved by shaking and heating on a boiling water bath in 10 cc of N sulfuric acid. After complete solution, the reagent is cooled under running water and filtered. The solution is of a greenish-yellow color, and if not perfectly clear it must be made so by further warming. It is considered best to prepare a fresh solution each day. Reagent 2 consists of 2 N sodium hydroxide, which is to be standardized against the N sulfuric acid used in making up reagent 1.

In carrying out the determination, 4 cc of a solution of the vitamin C in 2 percent metaphosphoric acid is treated with 1 cc of reagent 1, the solutions are mixed, 0.4 cc of reagent 2 is added, and the combined solutions are again thoroughly mixed. A sky blue color is developed and is compared in a colorimeter with that developed in a standard solution of known concentration.

A vitamin C content of 3γ (a concentration of 8 parts in 10^7 parts of the solution) gave a positive reaction.

Some critical remarks on the determination of ascorbic acid, M. Van Eekelen and A. Emmerie (*Biochem. Jour., 30 (1936), No. 1, pp. 25–27*).—A brief

review summarized the modifications made by a number of investigators of the Tillmans method (E. S. R., 69, p. 7) of using 2,6-dichlorophenolindophenol to determine the antiscorbutic value of various extracts. Directions and precautions in using the mercuric acetate method previously described by the authors (E. S. R., 73, p. 428) were given for obtaining satisfactory results.

This method was employed to determine the percentage of ascorbic acid recovered from pure ascorbic acid solutions and from urine, blood, and potato to which pure ascorbic acid had been added. The results showed a recovery of 96 and 94 percent in pure ascorbic acid solutions, respectively, with 0.5 and 1 cc and with 6 and 10 cc of a 20-percent mercuric acetate solution. A recovery of 97 and 99 percent of ascorbic acid was obtained from the blood, 95 and 98 percent from the urine, and 100 percent from the potato. The length of time the pure ascorbic acid solution was in contact with mercuric acetate solution reduced the recovery of the ascorbic acid from 98 to 81 percent, with a corresponding time interval of 5 and 60 min., respectively. Precipitation of thiosulfate with the mercuric acid solution was shown by titrating urine after mercuric acetate precipitation, the urine with added thiosulfate and without the acetate precipitation, and the urine with added thiosulfate after mercuric acetate precipitation. The values in cubic centimeters of indicator were, respectively, as follows: 1.4, 13, and 1.4 cc.

The objections to the lead acetate method of Dewjatnin and Doroschenko, noted above, were that H_2S was not used to reduce the reversibly oxidized ascorbic acid, that lead acetate does not precipitate cysteine, and that precipitation with lead acetate causes great losses of ascorbic acid in the urine in slightly acid or neutral solutions.

The objection to the reduction of silver nitrate by organs and extracts to determine their ascorbic acid content was that substances like cysteine, glutathione, and others inhibit reduction.

The tungstic acid method of Fujita et al., noted above, cannot be used in the presence of adrenalin because it inhibits the reaction and the values are too low.

The soybean, a plant immigrant makes good, W. L. Burlison (*Indus. and Engin. Chem., 28 (1936), No. 7, pp. 772–777, figs. 2; also Illinois Sta. Circ. 461 (1936), pp. 15, figs. 2*).—Following a very brief description of the soybean plant, this publication discusses soybean culture, industrial uses, disposition of the domestic crop, products derived from soybeans, imports, chemical composition, methods of processing soybeans, industrial use of soybean oil, use of soybean oil in the paint industry, soybean oil as a core binder, other uses for soybean oil, plastic industry uses soybean oil meal, glue from soybean oil meal, soybean oil meal for fertilizers, and further investigation needed.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [May–June 1936] (*U. S. Mo. Weather Rev., 64 (1936), Nos. 5, pp. 159–193, pls. 7, figs. 15; 6, pp. 195–225, pls. 11, figs. 10*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 5.—Temperature Survey of Kittitas County, Wash., by F. D. Young and F. A. Baughman (pp. 159–168); Tornado Disasters in the Southeastern States, April 1936, by J. B. Kincer (pp. 168–171); The Newfoundland Forest Fire of August 1935, by E. B. Shaw (pp. 171–175); and Duststorms of May 1936 in the United States, by R. J. Martin (p. 176).

No. 6.—Duststorms in the Southwestern Plains Area, by H. F. Choun (pp. 195–199); Winter Air-Mass Convergence over the North Pacific, by R. W. Richardson (pp. 199–203); Influence of Lake Ponchartrain on Fog Formation at Shushan Airport, New Orleans, La., by G. V. Fish (pp. 203, 204); Tropical Disturbances, June 1936, by I. R. Tannehill (pp. 204, 205); and Duststorms in the United States, June 1936, by J. P. Kohler (p. 206).

Long-range forecasting, F. Thone (*Sci. News Letter, 30 (1936), No. 805, pp. 170–172, figs. 2*).—This article reviews briefly the progress and possibilities of long-range weather forecasts on the basis primarily of the work of the Smithsonian Institution and the U. S. Department of Agriculture.

A new recording rain-gauge, J. B. Maltais (*Sci. Agr., 16 (1936), No. 9, pp. 495–498, figs. 5*).—A description and results of tests are given of a new recording rain gauge designed especially "to facilitate the continuous recording of rain or precipitation in inches and fractions of inch during a week on a chart which is divided in days and hours; second, to render the instrument simple in construction with the least wear for accurate, long, and reliable service required in an apparatus of this type."

The drought of 1934 and its effect on trees in Kansas, E. H. Stiles and L. E. Melchers (*Kans. Acad. Sci. Trans., 38 (1935), pp. 107–127, fig. 1*).—Summarizing observations on the effect of the excessive heat and drought of 1934 on trees of Manhattan, Kans., the author concludes that the drought and heat killed 25 percent of the trees and injured another 25 percent under nearly natural conditions. Under less favorable conditions, the drought killed more than 33 percent, leaving about 25 percent of the trees uninjured. Under the more favorable conditions, the drought killed less than 10 percent of the trees and injured about 25 percent.

The recent drought situation in southwestern Manitoba, J. H. Ellis, W. H. Shafer, and O. G. Caldwell (*Sci. Agr., 16 (1936), No. 9, pp. 478–488, figs 2*).—It is stated that "the drought of recent years in western Canada was one of the widespread periodic occurrences of lower than normal seasonal precipitation not uncommon in continental steppe regions." The results of a study of the relation of precipitation to wheat yields from 1885 to 1933 showed a better correlation of yields "with the rainfall of the previous fall months, August to October, plus that of the wheat growing season, April to July, than with that of the current growing season. Also, when the snowfall values are included, the correlation value falls. Hence as a measure of precipitation for this area, the rainfall which falls during the 'previous fall' (August to October) plus that of the wheat 'growing season' (April to July) may be taken as the criterion of a given season being relatively moist or dry. . . . From the standpoint of relatively low precipitation (or drought) years, it is interesting to note that from 1885 to 1916 the rainfall values fluctuated above and below the 49-yr. average in short periods only, so that after one or two dry seasons years with higher precipitation occurred."

SOILS—FERTILIZERS

[Soil and fertilizer studies by the Nevada Station] (*Nevada Sta. Rpt. 1935, pp. 37, 38*).—Conclusions are noted as to the nitrifiability of the nonhumus organic nitrogen in the soil, by R. Stewart, V. E. Spencer, and G. Hardman, and as to the ability of organic and inorganic phosphates to penetrate soils and their availability to plants, by Spencer, Stewart, and S. A. Lough.

[Soil research by the Vermont Station] (*Vermont Sta. Bul. 407 (1936), pp. 17–19*).—The station reports upon the discovery that overliming injury, previously noted at the same institution (E. S. R., 68, p. 598), is due to a reaction

with soil organic matter of woody origin; upon conservation of stable manure by the use of superphosphate; and upon a study of the control of flood and riverbank erosion.

Soil samplers, T. S. Coile (*Soil Sci., 42 (1936), No. 2, pp. 139–142, figs. 2*).—Two types of soil sampling cylinder are described, and their constructional detail is clearly indicated in fully dimensioned drawings.

The instrument used for obtaining samples of undisturbed soil for the determination of volume weight, air space, and water-holding capacity "consists of a cutting cylinder made of 5-in. high pressure steel pipe machined down to the specifications indicated on the diagram and an inner cylinder made of 5-in. seamless brass tubing. The brass inner cylinder is held in place by a ring and pin while the unit is being driven into the soil with a sledge hammer. A countersunk steel plate or a block of wood placed on the cylinder prevents it from being battered by the hammer. The cutting edge should be casehardened. Constructed as indicated, the soil cylinder has a volume of 600 cc, a depth of slightly less than 2 in., and an inside diameter of just under 5 in.

"Lids pressed from 10 oz. copper are used on the brass cylinders for transporting samples from the field to the laboratory. Squares of copper window screen, 16-mesh, have been used effectively over one end of the cylinders while the samples are being saturated with water, and later drained, for the determination of air space and water-holding capacity."

In the case of the cutting cylinder devised for taking samples of undisturbed soil for making determinations of the permanent wilting percentage, "cardboard ice cream containers of 1-pt. capacity are placed in an inverted position in the cutting cylinder before it is driven into the soil. The bottom of the container is cut off in the greenhouse, and seeds of the plant to be used for determination of the wilting percentage are planted. The surface is not sealed until the plants have become well established and the moisture content of the soil has been reduced to near the wilting percentage."

The author states that ordinary technical paraffin, of a melting point about 54° C., is satisfactory for sealing, and that "if the temperature of the paraffin is not over 60° when it is applied it will solidify as soon as it contacts the moist soil and will not injure the plants."

Soil survey of Mobile County, Alabama, B. H. Williams et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No. 42, pp. 47, figs. 2, maps 2*).—Mobile County consists of 784,640 acres composed, to the extent of about 30 percent, of low-lying and nearly level to undulating "flatwoods", the remainder of the area containing remnants of an eroded and dissected higher plain. Of these portions of the original higher lands surface, it is noted that "numerous saucerlike depressions, which are poorly drained the greater part of the year, are scattered throughout many of these nearly level areas." Only about 10 percent of the county was found to be under cultivation.

The soils of the area described were found to form 20 series and 27 types. Norfolk sand, which constitutes 16 percent of the county, "is loose and leachy and retains only small quantities of plant nutrients and moisture for growing crops", and of this soil "probably not more than 1 percent is now farmed." Norfolk loamy fine sand forms a further 14.7 percent and is not largely farmed. Swamp, meadow, undifferentiated Guin soils, muck, tidal marsh, made land, and coastal beach total 22.5 percent of the county.

Clinton County soils, E. A. Norton and R. S. and L. H. Smith (*Illinois Sta. Soil Rpt. 57 (1936), pp. 33, pls. 2, figs. 11*).—Clinton County, occupying an area of 318,118 acres in the southwestern part of the State, has a generally smooth land surface and lies wholly within the drainage basin of the Kaskaskia

River. The soils are here described as 24 series and 27 types. Among the larger aggregate areas are 20.92 percent of Bonnie silt loam, 18.49 percent of Cisne silt loam, and 16.01 percent of Putnam silt loam.

Soil survey of Lee County, North Carolina, S. O. PERKINS and E. F. GOLDSTON (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1933, No. 1, pp. 42, figs. 2, map 1*).—Lee County consists of 163,200 acres, having a varied surface relief, in central North Carolina. Drainage conditions range from those on many of the steeper slopes where run-off is so rapid that it causes serious erosion to that of the low bottoms, flats, and depressions in which there is no well-established natural drainage.

The soils found are listed as 17 series, 22 types. Wadesboro gravelly silt loam, including 5.6 percent of an eroded phase and 9.7 percent of a mixed phase, constitutes 21.1 percent, and Norfolk sandy loam, including a deep and a gravelly phase, forms 12.6 percent. Under the heading "miscellaneous land types", 22.5 percent is described and it is stated that, "owing to low productivity, steepness of slope, stoniness, eroded condition, imperviousness of subsoil, or inadequate surface drainage, only a comparatively small proportion of these soils is used for growing crops."

The survey was made in cooperation with the North Carolina Experiment Station and the State Department of Agriculture. Data compiled by E. F. Goldston on agricultural methods and management are included.

Investigations of Red soils of Attica, Greece, K. I. NEVROS and I. A. ZVORYKIN (*Soil Sci., 41 (1936), No. 6, pp. 397–415, pls. 2*).—The authors discuss the influence both of topography and of climatic conditions upon soil formation, calling attention to the fact that the region from which the soils studied were collected has mild, wet winters and dry summers, "during which the conditions become similar to those of a desert." A probable effect on soil development of alternate eluviation, or descent of the soil solution during the rainy season, and illuviation, or rise of the soil solution during the period of little or no rainfall, is suggested. A tabular summary of climatic records for the period from 1858 to 1928 illustrates the discussion of the effects of climatic conditions on soil changes.

Profiles of two soils, the one having a yellowish light-red surface, the other a dark-red A horizon, are described, and the chemical analyses, exchangeable-base contents, and the percentages of silica and alumina extracted by 5 percent potassium hydroxide are compared with corresponding data from certain Moravian Karst soils. Figures for the exchangeable-base content of a Thessalian profile are also shown. As a part of their conclusions, the authors state that:

"It seems to us that considerable difference of opinion as to the origin of the Red soils is due to the absence of systematic studies of the Mediterranean region. This difference of opinion is accounted for by climatic conditions, topography, erosion, saturation processes with sodium, solodi, and podzolic processes. The last condition can take place in regions of abundant rainfall (in some Mediterranean regions this reaches 800 mm) and in regions situated high above sea level. The variety of conditions noted seemingly causes variation in the character of the Red soils, not only in different latitudes and altitudes but even within the boundaries of a small region whose soil-forming history is very old."

Certain practical aspects of soil chemistry research, W. H. MACINTIRE (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 1, pp. 22–33*).—This address has been previously noted (E. S. R., 74, p. 143).

The state in which the hygroscopic moisture exists in soils as indicated by its determination with alcohol, G. J. BOUYOUCOS (*Soil Sci., 41 (1936), No. 6,*

pp. 443–447; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 61, 62).—The author calls attention to the fact that "hitherto it has not been definitely known whether the hygroscopic moisture of soils, which is driven off by heating at 110° C., exists exclusively as film or physically adsorbed water or partly as chemically combined water. An attempt has been made to throw light upon this question by extracting soils with alcohol and then determining the quantity of water found in the alcoholic extract. By means of a special reagent consisting of fusel oil, toluene, and tartaric acid, the water extracted by the alcohol can be determined volumetrically.

"It was found that in the case of mineral soils the alcohol extracts all the hygroscopic water, indicating that the hygroscopic moisture in mineral soils exists entirely in the form of physically adsorbed or film water. In the case of mucks and peats and some other organic materials studied, the alcohol extracts about one-third less water than is indicated by the oven-dry method. The explanation for this is that either the alcohol is unable to extract all the water from the organic materials, or the oven-dry method causes these organic materials to undergo partial decomposition or volatilization of substances other than water, with consequent high and erroneous values for hygroscopic water. The latter seems the more likely possibility."

A rapid indirect method for determining the wilting coefficient of soils, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 581–586*).—The author of this contribution from the Michigan Experiment Station presents further evidence of the close agreement between wilting point and moisture content critical for freezing, a relation to which he first called attention in 1916 (E. S. R., 38, p. 16). He describes a rapid and convenient procedure for determining, by means of a Beckmann thermometer, the depressions of freezing point in soils in a series of soil samples of successively decreasing, and definitely known, moisture contents.

"One of the most striking things revealed by the results given . . . is the extreme sensitiveness of the freezing point depression as the moisture content decreases. At the higher moisture contents a decrease of 5 percent moisture may cause an increase of only 0.012° C. in the freezing point depression, but at the lower moisture contents, and especially near the critical water content where solidification fails to take place, a decrease of only 2.5 percent moisture may cause an increase of more than 1° in the freezing point depression. This extreme sensitiveness of the freezing point depression to the water content at the lower moisture contents is of great practical importance, for it makes possible the determination of the wilting coefficient by the freezing point method with an accuracy of about 1 to 2 percent." It is shown that "the difference in the moisture content between the points where a freezing point determination can and cannot be made is only 2.5 percent. By estimation this amount can be reduced to about 1 percent, which would represent a very high accuracy in determining the wilting point indirectly and rapidly."

The intensity of removal of added cations from soil colloids by electrodialysis, H. P. Cooper and W. R. Paden (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 597–608, figs. 2*).—The authors present, from the South Carolina Experiment Station, evidence which, in their opinion, "supports the suggestion that there is a close relationship between the oxidation-reduction potentials of nutrient materials and the intensity of their removal from soil complexes by electrodialysis."

Samples of soil were electrodialyzed for 24 hr. Definite weights of soil were treated with single salt solutions. A composite sample made from the soil samples treated with potassium and calcium chlorides were electrodialyzed

for 32 hr. Samples of the diffusate were collected at 2-hr. intervals for the first 16 hr. and at 8-hr. intervals for the second 16 hr. Soil samples containing a single added cation were electrodialyzed in a similar manner.

The data "illustrate very clearly the differential in intensity of removal of the various metals from soils by electrodialysis. There is a correlation between the intensity of removal of certain cations from soils and the strength of ions. The strongest ions are removed most rapidly from the soil. A large proportion of the strong cations was found in the first two fractions of the diffusate. "Oxidation-reduction potential values and ionization-potential values are useful in predicting the intensity of removal of cations from soils by electrodialysis. The adsorption and removal of an electrolyte from a soil appears as an additive property of its ions. It appears that the quantitative adsorption and removal of any individual added cation is probably influenced by the solubility of the compound or compounds it may form in the soil complex. Added sodium and calcium which apparently form relatively soluble complexes in the soil may be removed more completely than added potassium, which apparently forms certain relatively insoluble compounds in the soil. The solubility values of various electrolytes may be of great value in an interpretation of some of the striking growth responses of crops observed from inadequate or excessive amounts of the so-called minor plant nutrients. In areas using heavy applications of commercial fertilizer the insufficient quantities of the minor plant nutrients in the soil are often the limiting factors in determining crop yields."

The composition and ionic exchange of ferric silicates and phosphates, A. J. Pugh and M. S. du Toit (*Soil Sci., 41 (1936), No. 6, pp. 417–431, figs. 7*).—The authors of this contribution from the New Jersey Experiment Stations record the results of an experimental investigation of ionic exchange reactions with synthetic ferric silicates and phosphates, and discuss the application of the isoelectric point and the theory of amphoteric electrolytes to the interpretation of the observed ionic exchange reactions.

For the preparation of the silicates, "a normal solution of ferric chloride was titrated against a solution of sodium silicate of known silica content until the iron was completely precipitated, which occurred at pH 5.4–5.6. To obtain precipitates of lower $\frac{SiO_2}{Fe_2O_3}$ ratio, the amount of sodium silicate was progressively reduced, the amount of reduction being made up with N NaOH until a pH of 5.4 was again reached. To obtain precipitates of high $\frac{SiO_2}{Fe_2O_3}$ ratio, the amount of sodium silicate was kept constant, but the ferric chloride was reduced, the diminished acidity being made up with N HCl to bring the whole, when mixed, to pH 5.4. By means of preliminary titrations the exact amounts of reagents required to fulfill the afore-mentioned conditions were determined. . . . To prevent extensive hydrolysis, the precipitates were washed free of chlorine with 95 percent alcohol. The residual alcohol was removed by drawing a current of air through the filter." The phosphates were prepared in the same way, except that the complete precipitation of the iron occurred at pH 4.3. "The base-exchange capacity was determined on the other by leaching with N Ba-acetate (pH 7.0) until the pH of the leachate was equal to the pH of the original Ba-acetate. Ten cc of N $BaCl_2$ was then added to the filter, and the precipitate was washed free of chlorine with water. The adsorbed barium was subsequently replaced with N NH_4Cl, and the base-exchange capacity was calculated to a constant weight of the dry material."

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It was found that "the adsorption of sulfate diminishes with increasing acidoid content of the colloid", that "the hydroxyl ion displaces the $[SiO_3^=]$ and $[PO_4^≡]$ ions in equivalent proportions", and that "the ferric silicates have an optimum ratio at which the base exchange is a maximum."

A comparison of the specific gravity balance and the pipette methods of determining density of soil suspensions, N. E. Edlefsen and R. C. Cole (*Soil Sci., 42 (1936), No. 2, pp. 131–137, pl. 1*).—The authors of this contribution from the California Experiment Station compared the use of the specific gravity balance with the pipette methods for determining the density of soil suspensions. Results obtained with different sized ellipsoidal plummets closely agreed with one another and with the data obtained by the pipette method but did not agree with data obtained wih a spherical plummet. Replicate determinations made with the specific gravity balance on a given soil agreed closely. Initial suspension densities as high as 5 percent were not great enough to interfere with the free fall of particles.

"The specific gravity balance is suitable for use over about the same range of settling velocities as the pipette method but requires considerably less time to make a measurement."

The influence of the reaction of soil strata upon the root development of alfalfa, H. N. Watenpaugh (*Soil Sci., 41 (1936), No. 6, pp. 449–467, pls. 3, figs. 6*).—The experiments reported in this contribution from the Pennsylvania Experiment Station were carried out with alfalfa grown on a DeKalb silt loam surface soil placed in large sewer tile. The surface and sublayers of the soil were treated with varying quantities of limestone.

The pH value of the surface soil varied with the season to some extent, and in the limestone-treated tile averaged slightly lower the second year than the first. The pH and replaceable calcium by 0.1 N HCl extraction had a correlation of 0.856±0.0165 over the period of two seasons. The pH values of the sublayers were influenced materially by the calcium carbonate additions to the layers above, the amount depending on both the quantity of limestone added to the upper layer and that added to the lower layer. The depth of effect on pH in the sublayer depended also to some extent on length of liming history.

Root development correlated definitely with the pH and with the replaceable calcium of the various soil layers. A pH of 4.8 checked root growth almost entirely. A pH slightly above this retarded root growth. The roots grew well in a pH above 5. Depth of root penetration is definitely correlated with the yield of alfalfa, under the conditions of this experiment.

The physical changes in soils of the southern high plains due to cropping and wind erosion and the relation between the $\frac{\text{sand+silt}}{\text{clay}}$ ratios in these soils, H. A. Daniel (*Jour. Amer. Soc. Agron., 28 (1936), No. 7, pp. 570–580, figs. 4*).—At the Oklahoma Experiment Station the mechanical analyses of a large number of cropped and virgin surface and subsurface soils of the southern high plains were compared with the sand, silt, and clay contents of the soil drifts.

The greatest difference between drift material and the cropped and virgin surfaces occurred in the coarse- and medium-textured types. The drifts contained an average of 37.8 percent less silt and clay and 29.3 percent more sand than the adjacent virgin soil. The increase in percentage of sand in the drifts was in proportion to the amount of silt and clay removed by the wind shifting the soil.

The $\frac{\text{sand+silt}}{\text{clay}}$ ratios in these soils were compared to that in the drifts. "The drift from the coarse-textured soils had the highest clay ratios and the

clay soils the lowest; however, the data reported seemed to indicate that there was very little relation between the clay ratio and wind erosion."

The effect of wind erosion and cultivation on the total nitrogen and organic matter content of soils in the southern high plains, H. A. Daniel and W. H. Langham (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 587–596, figs. 2*).—The authors determined, at the Oklahoma Experiment Station, the total nitrogen and organic matter content in cropped, virgin, and drifted soils of the southern high plains. The drift had an average of 24.5 percent less organic matter and 28 percent less nitrogen than the virgin soil.

"The data indicate that each time a soil is shifted more plant nutrients are removed, and that after being moved a large number of times the dunes from soils that are dispersed by the wind finally became sand, regardless of the original texture. The organic matter : nitrogen ratios were determined, and it was found that this ratio in the cropped soil was 22.47 and that in the virgin 23.3, while the average of the drifts was 24.44.

"Since the total nitrogen and organic matter in the soil profile decreases rapidly with depth, the data clearly prove the great necessity for retaining the surface soil. As a result of cropping and wind erosion, the organic matter in the cultivated soils was decreased 18 percent and the nitrogen 15 percent. Very little difference occurred in the nitrogen and organic matter content of the cropped and virgin subsurface soils."

Transformation of nitrate in water-logged soils, P. K. De and S. Nath Sarkar (*Soil Sci., 42 (1936), No. 2, pp. 143–155*).—Experiments performed with a number of soils at the University of Dacca, India, showed that nitrate is rapidly lost in waterlogged soils. Detailed experiments with Dacca and Faridpur soils indicated that this loss is not due to the reduction of nitrate to ammonia and gave no evidence to show that in waterlogged soils all of the nitrate is denitrified. An increased production of carbon dioxide and a rise in bacterial numbers, occurring in waterlogged soil after addition of nitrate, indicated that the added nitrate is assimilated by the micro-organisms. In the presence of added organic materials, whether rich or poor in nitrogen, nitrate disappeared very quickly. A pot-culture experiment showed that, in the presence of a rice crop, little nitrate is lost in drainage water. In the absence of a crop the loss was considerable.

It is suggested that, in soils having ratios of energy carbon to nitrate nitrogen greater than 30–50: 1, nitrate will be rapidly assimilated by the microorganisms when such soils are waterlogged. When the ratios are narrower, a portion of the nitrate will remain in the soils and may denitrify slowly.

Total nitrogen as a factor influencing nitrate accumulation in soils, P. L. Gainey (*Soil Sci., 42 (1936), No. 2, pp. 157–163*).—The author of this contribution from the Kansas Experiment Station shows that "when the nitrogen content and the nitrate-accumulating abilities of a large number of soils are determined and the data thus obtained are grouped on a basis of the nitrogen content of the soils and averaged, an almost perfect direct relationship may appear to exist between the total nitrogen content and the nitrate-accumulating ability. On the other hand, if the original data are used as a basis for calculating the coefficient of correlation, the relationship between the two factors may be found to be very slight or even nil."

Decomposition of lignin by microörganisms, S. A. Waksman and I. J. Hutchings (*Soil Sci., 42 (1936), No. 2, pp. 119–130*).—An investigation of the decomposition of lignin in a native state, namely, in oat plants harvested at various stages of growth, and of lignin isolated in the form of phenol-lignin has been carried out in the New Jersey Experiment Stations.

"In accordance with results of other investigators and with those obtained in this laboratory, it was found that lignin in plant materials was more resistant to decomposition than the other groups of plant constituents. However, it underwent a gradual, even if slow, decomposition. Several organisms were isolated from the soil and found capable of decomposing phenol-lignin from spruce wood, oat straw, and peat. In order to bring about the decomposition of lignin by these organisms, it had to be dispersed in water. This was accomplished by dissolving the lignin in alcohol and adding it to an excess of water. The solvent was then removed by evaporation at reduced pressure. Except in a few preliminary experiments, where crude enriched cultures of bacteria and fungi were employed, the rate of decomposition of the lignin was slow. No product of lignin decomposition could be isolated or demonstrated. The efficiency of the carbon utilization by the micro-organisms attacking the lignin was very high."

Crop yields from Illinois soil experiment fields, including the crop season of 1935, F. C. Bauer, A. L. Lang, C. J. Badger, L. B. Miller, C. N. Farnham, and P. E. Johnson (*Illinois Sta. Bul. 425 (1936), pp. 145–243, figs. 3*).—This bulletin deals with recent results of long-period field experiments which are periodically noted (E. S. R., 71, p. 603). Some of the older data are also summarized in the present bulletin. The work is taken up in three parts, preceded by an introduction and followed by an index of fertilizer and treatment materials. Part 1 deals with crop yields of 1934 and 1935, with summaries for 1932–35, part 2 discusses the influence of various materials in increasing crop yields and values, 1932–35, and part 3 consists of long-time summaries of crop yields on individual fields.

Soil liming investigations.—I, The calcium carbonate equilibration method of liming soils for fertility investigations, J. A. Naftel (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 609–622, figs. 11*).—It is reported from the Alabama Experiment Station that "the calcium carbonate equilibration method of liming soils was found to offer desirable features for a comprehensive study of liming problems."

The quantity of calcium sorbed from the added calcium carbonate at the point of equilibrium is termed "Ca-sorption value." The sum of the latter value and the native exchangeable Ca is termed "Ca-sorption capacity." A laboratory procedure for obtaining these values is given. Increments of the Ca-sorption capacity of the soil are proposed for use as an index of lime requirement. The results from such a method were used with yield curves to obtain figures believed to represent the optimum quantities of lime for soils and cropping systems. The calcium carbonate equilibration method was found to give complete titration curves with very definite end points on electrodialyzed soil colloids.

"The value of this method for studying the effect of lime on the sorption of ions and on the biological activity in soils was indicated by studies on potash and nitrification."

The ammoniation of waste sulphite liquor and its possible utilization as a fertilizer material, M. Phillips, M. J. Goss, B. E. Brown, and F. R. Reid (*Jour. Agr. Res. [U. S.], 53 (1936), No. 3, pp. 209–224, fig. 1*).—An investigation carried out in the U. S. D. A. Bureaus of Chemistry and Soils and of Plant Industry yielded, among others, the following observations:

"When 1 part, by weight, of the neutralized dry residue of waste sulfite liquor, was heated at 200° C. for 20 hr. with 6 parts, by volume, of 28 percent aqueous ammonia, a product was obtained which contained 10.55 percent of nitrogen. When ammonia was passed into waste sulfite liquor until the concentration of free ammonia was 14.5 percent, and the resulting solution was heated at 220°

for 20 hr., the product obtained contained 10.15 percent of nitrogen. When the ammoniations were conducted at 200° or above, the percentage of ammoniacal nitrogen in the products was generally negligible. The percentage of ammoniacal nitrogen in the products obtained from the ammoniation experiments conducted at 180° ranged from 0.55 to 1.92 percent. While the percentage of water-insoluble nitrogen showed some variation, it generally increased with the increase in the temperature of ammoniation. The percentage of insoluble nitrogen soluble in neutral permanganate in the ammoniated product was not greatly affected by the temperature of ammoniation.

"The ammoniated products obtained were found to be nontoxic to the microorganisms of the soil, although their ammonification and nitrification were rather slow as compared with that of casein and cottonseed meal and ammonium sulfate and dried blood, respectively.

"Vegetative tests conducted in the greenhouse show that as a source of nitrogen the ammoniated material caused increased yields of millet when grown on Norfolk loamy fine sand, but it was not as efficient in this respect as either dried blood or a mixture of sodium nitrate and ammonium sulfate.

"Ammoniated waste sulfite liquor may prove to have value as a potential source of nitrogen, as a soil conditioner, or as a source of humus, but as an immediate source of nitrogen for millet it was found to be considerably less effective than either dried blood or a sodium nitrate-ammonium sulfate mixture."

Analyses of commercial fertilizers (*South Carolina Sta. Bul. 307 (1936), pp. 56*).—This bulletin reports, for 1935–36, the usual annual analytical data.

AGRICULTURAL BOTANY

Chronica Botanica, edited by F. Verdoorn et al. (*Chron. Bot., 2 (1936), pp. 479, figs. 148*).—This is the second issue of this annual compendium of botanical information, previously noted (E. S. R., 74, p. 169).

Preliminary opinions concerning nomenclature proposals submitted to the Sixth International Botanical Congress, Amsterdam, 1935, T. A. Sprague (*Cambridge, Eng.: Univ. Press, [1935], pp. 28*).—

Synopsis of proposals concerning nomenclature submitted to the Sixth International Botanical Congress, Amsterdam, 1935, T. A. Sprague (*Cambridge, Eng.: Univ. Press, [1935], pp. 80*).

Vitamins and plants, A. I. Virtanen (*Nature [London], 137 (1936), No. 3471, pp. 779, 780*).—The brief review in this note appears to indicate that vitamin C is a phytohormone indispensable to plants. The fact that certain compounds acting as vitamins in animals also have important functions in plants is additional evidence of the similarity of the metabolism of plant and animal cells.

The response of roots to "root-forming" substances, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 439–445, figs. 2*).—*Cissus sicyoides jacquini*, grown in a greenhouse, produced aerial roots which failed to branch before contact with soil or other moist material. When severed, from one to two new roots arose just above the cut surface. The normal elongation of the roots averaged 4 in. per day.

The root-forming powers were studied for six chemical growth substances—α-naphthaleneacetic acid, indolebutyric acid, indoleacetic acid, indolepropionic acid, Δ-(3-indolyl)-valeric acid, and phenylacetic acid—used both as lanolin preparations and as aqueous solutions. When the lanolin preparations were applied along the region of elongation, new branch roots appeared through the epidermis in from 3 to 5 days, and the substances also induced swelling and retardation in elongation of the roots.

The growing tip had a dominating influence over the branch roots. Newly initiated roots were inhibited when the tip of the main root resumed growth after having been retarded by the substance applied to it. By re-treatment of the tip, the new branch roots could be induced to grow. When the region producing the new roots was immersed in water, this apical dominance was overcome. Application of the growth substances back of the region of elongation proved comparatively ineffective. Either the material failed to penetrate or old tissue is less susceptible than that of the growing region.

The influence of hetero-auxin on the growth of root hairs and roots of Agrostemma githago L., A. MEESTERS (*K. Akad. Wetensch. Amsterdam, Proc., 39 (1936), No. 1, pp. 91–97, figs. 3*).—The growth of both roots and root hairs of *A. githago* was inhibited by the addition of heteroauxin, but the root hairs were less sensitive to its action. Solutions at the same pH as those containing the heteroauxin, obtained by adding acetic acid, failed to show this inhibition in growth, indicating a specific influence of the growth substance. Heteroauxin was unable to induce chemotropic curvatures of the root hairs in this plant.

Light growth response and auxin curvatures of Avena, J. VAN OVERBEEK (*Natl. Acad. Sci. Proc., 22 (1936), No. 6, pp. 421–425, figs. 3*).—By an ingenious technic evidence was obtained that the curvature rate of decapitated oat coleoptiles to which auxin was unilaterally applied responded in a way similar to that of the growth rate of the intact seedling when continuously exposed to light.

The effect of pigment on phototropic response: A comparative study of reactions to monochromatic light, G. A. ATKINS (*Ann. Bot. [London], 50 (1936), No. 198, pp. 197–218, pl. 1, figs. 6*).—An apparatus avoiding the action of several variable factors and allowing high accuracy is described. With its use the response for *Avena* agreed substantially with results by previous workers, the maximum being about 4,480 a. u., with diminution in the ultraviolet and red. Under red light only a slight effect was noted. With *Lepidium sativum* there was a second maximum in the red, and the initial maximum moved to about 4,640 a. u. in the blue. In the absence of chlorophyll *Lepidium* gave the *Avena* type of response, and the nodal curvature of *Avena* at the second leaf stage, with chlorophyll present, was similar to *Lepidium*. Plants with red anthocyanin pigment in the epidermis gave a sluggish response, the pigment absorbing light without inducing curvature. The presence of cortical pigmentation in *Celosia cristata* caused the initial maximum to move to 4,860 a. u. in the blue green.

"A relationship is suggested between phototropic curvature and the light gradient of the photosensitive area, rather than a direct photochemical effect on some growth regulator."

Effect of variation in length of day on growth and dormancy of trees, P. J. KRAMER (*Plant Physiol., 11 (1936), No. 1, pp. 127–137, figs. 4*).—Potted seedlings of *Fraxinus americana*, *F. pennsylvanica lanceolata*, *Fagus grandifolia*, *Robinia pseudoacacia*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Quercus stellata*, *Q. borealis maxima*, *Q. Alba*, and *Pinus taeda* were grown with short, normal, and long photoperiods. With the normal length of day all species ceased growth in the fall as early in a warm greenhouse as out of doors. For most of the species the growing season was prolonged by a 14½-hr. day and shortened by an 8½-hr. day. Three species subjected to continuous light grew all winter. Resumption of growth by dormant trees brought indoors in midwinter was hastened by exposure to long days and retarded by short days. These results indicate that length of day may in part control the duration

of the growing season of certain tree species. It is believed that dormancy is not caused by any inherent rhythm, but is produced by the effect of various environmental factors on the complex of internal physicochemical phenomena controlling growth.

On photoperiodism and changes in the enzymatic system, N. KRASSINSKY, A. A. KONDRASHOVA, and N. I. VINOGRADOVA (*Ann. Bot.* [*London*], *50* (*1936*), *No. 198, pp. 293–304*).—Shortening the day caused sharp changes in the state of the enzyme system of bean (*Phaseolus vulgaris*) fruit and leaves and of chrysanthemum leaves, but in *Cineraria hybrida* no definite changes were induced during 4 mo. In bean and chrysanthemum shortening the day induced a very considerable and regular, though evidently gradual, increase in the activity of the oxidizing enzymes (catalase and peroxidase). The absence of such results in *Cineraria* agrees with the absence of any considerable difference in the general development of the plants submitted to a full or a shortened day. Thus the increase in catalase and peroxidase activity in the bean and chrysanthemum must be related to the photoperiodic reaction and the photoperiodic induction, and does not result merely from changes in the duration of daylight.

Shortening the day also provoked regular changes in the activity of amylase and saccharase in the bean and chrysanthemum, but the direction of these changes differed in the two species. Thus the changes in the activity of the hydrolyzing enzymes induced by a shortened day apparently depend on the individual peculiarities of the plants and of their enzyme systems. *Cineraria* manifested no definite changes in these two enzymes in relation to changes in length of day.

Leaf-movements of Mimosa pudica in relation to the intensity and wave length of the incident radiation, P. R. BURKHOLDER and R. PRATT (*Amer. Jour. Bot.*, *23* (*1936*), *No. 3, pp. 212–220, figs. 3*).—"When young plants of *M. pudica* are placed in darkness for a few minutes during the daytime their leaflets assume a closed position. The rate of leaflet opening in 'dark conditioned' plants when subjected to radiation of measured intensity and controlled wavelengths has been determined in several series of experiments. Upon exposure to white light from a tungsten lamp, the leaflets open more rapidly the greater is the intensity of radiation. Over the range 2.2 to 417.0 ergs/mm^2/sec., the time required for opening may be described as a hyperbolic function of the intensity. In radiation of sufficient intensity up to values of about 55 ergs/mm^2/sec., leaflet opening occurs readily in blue to long ultraviolet and in long-red radiation, but little or no response is evoked by the orange, yellow-green, or infrared rays."

Rate of adjustment of leaf temperature to incident energy, C. A. SHULL (*Plant Physiol.*, *11* (*1936*), *No. 1, pp. 181–188, figs. 2*).—Adjustment of leaf temperature to incident energy was measured by means of thermocouples. Using a sunshine carbon arc source at 2.5 ft., with energy content of 0.229 calorie/cm^2/min., temperature equilibrium was attained at an average of 89 sec. in *Pelargonium* leaves, 120 sec. in *Begonia* leaves, and 115 sec. in *Caladium* leaves. These time periods were several times longer than theoretical calculations based on previous energy relations studies would demand. It is suggested that all of the energy relations should be remeasured with specific leaves in the hope that empirical observations and theoretical calculations may be brought into satisfactory agreement.

Radial growth and extension growth in the tree, J. H. PRIESTLEY (*Forestry*, *9* (*1935*), *No. 2, pp. 84–95*).—This is a progress report and theoretical discussion of studies carried out in the University of Leeds, the main problem under investigation being the curious contradiction in the behavior of the tree in re-

spect to its two characteristic modes of growth, viz, the progress of extension or upward growth and that of increase in girth or radial growth. The latter starts in the twig beneath the growing bud and spreads from thence rapidly down the tree. This rapid downward spread of cambial activity is the first salient difference between ring-porous and diffuse-porous trees. The "strip" method—consisting in the peeling off and microscopic examination of the soft tissues from the hard surface of the old wood after a piece of bark has been removed—furnished the technic for following the basipetal progress of radial growth and showing the almost instantaneous perforation of the cross walls of the vessel segments in the cambium region.

It is believed that the factor controlling the differentiation of the vessel is the rate at which cambial growth is being resumed in a basipetal direction, and that vessel differentiation may be expected to occur, without interruption, in one continuous file of cells from the slender branch to the base of the trunk. The vessels into which liquid is rushing often appear to be longer than the tree, and the only possible source of this water is the old wood, over the surface of which the new tissues are lying. The contents of the semipermeable protoplasts provide the osmotic force to absorb this water from the old wood and to drive outward the wall of the new vessel until the counterpressure of the surrounding tissues prevents further expansion. Vessel differentiation has proved to be a mechanism, inherent in the process of radial growth of the hardwood tree, which must have vital significance for the movement of water into the growing shoot. The amount of extension growth in a shoot may also well be closely connected with the differentiating vessel systems which are in longitudinal connection with the shoot. The wood elements forming in summer always appear to be associated with growth activity proceeding at the shoot apexes above. The vigor of phloem production is emphasized, and it is thought that in the phloem, which commences to swell and differentiate before the cambium commences activity again, is offered the system which renders possible the extremely rapid spread down the tree of the renewed impetus to growth.

Are living cells involved in the ascent of sap? G. J. Peirce (*Amer. Jour. Bot.*, 23 (1936), No. 2, pp. 159–162).—Using intact and otherwise undisturbed plants of *Ricinus communis* and of *Aesculus californica* growing in the soil, experiments were made by applying either cooling or warming liquids to the stems and petioles, the adjacent leaves and leafy branches of the same plants serving as controls. By applying liquid air, salt and ice, ice and water, and warm water (at 70° C.), the "sap stream" was either checked or accelerated. The leaf blades were flat or grooved according to the supply of water, sufficient water being indicated by flat, expanded blades and deficient water by an upward bending on either side of the midrib and main veins. This bending or grooving was an indicator, or preliminary, of wilting. With lowered temperature in a segment of a stem or petiole, the living cells bordering the vascular elements were affected as well as the water within the vessels and tracheids. Presumably the water vapor condensed, forming or joining a film on the inner surface of the vascular walls, the freedom and rate of movement being correspondingly diminished. Since the activities of other cells decline with falling temperature, it is inferred that the living cells adjacent to the vascular elements behave similarly and that the maintenance of the vascular system is therefore less perfect at low than at higher temperatures.

Although using healthy, whole plants and applying some new methods to the study of the involvement of living cells in sap ascent, the results are believed to justify only the conclusion that living cells condition or affect, but do not accomplish or effect, the water movement through vascular plants.

The absorption and accumulation of solutes by living plant cells.—VII. The time factor in the respiration and salt absorption of Jerusalem artichoke tissue (Helianthus tuberosus), with observations on ionic interchange, F. C. Steward and W. E. Berry (*Jour. Expt. Biol., 11 (1934), No. 2, pp. 103–119, figs. 4*).—Continuing this series (E. S. R., 72, p. 458), the rapid decline in the CO_2 production of immersed, aerated artichoke disks is confirmed. Dilute potassium bromide solutions caused a temporarily increased respiration, quickly disappearing after 24 hr. Washed, blotted artichoke disks, immediately after reimmersion, released electrolytes to both distilled water and dilute salt solutions, but reabsorption was extensive after 18 and complete after 48 hr. Decreasing respiration was accompanied by decreasing ability to absorb potassium bromide. Its absorption from the external solution was accompanied by a decrease of conductivity in the outer solution and an increase in that of the expressed sap.

"Some factor associated with long, continuous contact of artichoke tissue with dilute bromide solutions tends to reduce absorption compared with a series of short periods. . . . The general relation between salt absorption and respiration for artichoke is established. An indirect role is preferred to a direct one. Respiration is assumed to maintain vital metabolic processes which supply the energy necessary for an absorption process in which work must be done."

The absorption and accumulation of solutes by living plant cells.—VIII. The effect of oxygen upon respiration and salt accumulation, F. C. Steward, W. E. Berry, and T. C. Broyer (*Ann. Bot. [London], 50 (1936), No. 198, pp. 345–366, figs. 5*).—Continuing this series (see above), the effect of oxygen concentration on CO_2 production and salt accumulation ($K^{\cdot}$ and Br') was examined in carrot and artichoke, and in roots of potato grown in water, all results agreeing essentially with those previously reported for potato disks. Respiration was only appreciably affected by changes in oxygen concentration in the rapidly flowing gas stream with concentrations lower than that of the air. Cells developed directly in water withstood lower concentrations of oxygen than the disks of storage tissue. In the concentration range in which oxygen limits respiration, decrease in oxygen pressure caused a marked decrease in respiration. Increased respiration due to reduced oxygen pressure was not observed. High respiration in nitrogen was not a general property and may be restricted to cells which have permanently ceased growth and active metabolism.

The effect of oxygen on the time drift of respiration of artichoke and carrot disks immersed in water is described. With artichokes, the conspicuous response to oxygen virtually disappeared after a protracted period, by which time the respiration rate had declined to the very low value typical of the uncut tuber.

The oxygen concentrations limiting respiration are also those limiting salt absorption. Below these, both potassium and bromide accumulation were retarded, and apparently in the same degree. It was clear in all cases (potato, artichoke, carrot disks, and potato roots) that aerobic only, and not anaerobic, metabolic processes are related to salt accumulation. Potassium and bromide accumulation vanished either at zero oxygen or at a low oxygen concentration.

It is emphasized that the direct effects of mere CO_2 production are not alone involved. Aerobic metabolism is believed to be that of a potential source of energy, not for the salt accumulation process alone but rather to maintain the vital activity and growth with which salt accumulation seems always to be associated.

Comparative sulfur and phosphorus content of plants grown in the same soil [trans. title], G. Bertrand and L. Silberstein (*Compt. Rend. Acad. Sci.*

[*Paris*], *201* (*1935*), *No. 27*, *pp. 1449–1453*).—Of the 37 species planted in an especially uniform plat of garden soil, 29 were sufficiently normal in growth for chemical analysis comparisons, and to these were added 4 other species which came up spontaneously. The sulfur/phosphorus ratios of these 33 species, as tabulated, were nearly equal to, or above, unity in most cases. The results are believed to show that the contents of the different species in these elements do not depend solely on the soil composition but also, if not more, on the physiological needs of the plants and on the ability to satisfy those needs. Some species fixed about 10 times more sulfur than others (from 0.15 to 0.20 parts per 100 of the dry weight in some and up to 1.9 parts in other species). Phosphorus fixation, without any parallelism, varied only from 0.24 to 0.85 parts per 100 of dry weight.

From a knowledge of the chemical composition of several of those plants which were rich in sulfur, it is believed that this element does not occur dominantly in the tissues under the mineral form, as in the soil, but rather in the form of organic compounds, and that consequently the sulfur needs of the plant are, from one species to another, at once very variable and very different from the needs for phosphorus.

Comparative sulfur and nitrogen content of plants grown on the same **soil** [trans. title], G. Bertrand and L. Silberstein (*Compt. Rend. Acad. Sci.* [*Paris*], *202* (*1936*), *No. 4*, *pp. 261–264*; *Ann. Agron.* [*Paris*], *n. ser.*, *6* (*1936*), *No. 3*, *pp. 365–367*).—The quantitative determinations here tabulated and discussed were made on the 33 plant species analyzed for sulfur/phosphorus ratios (see above). On the quantitative basis the results showed nitrogen to occupy fourth place in the composition of the plants analyzed, following immediately after oxygen, carbon, and hydrogen. It is, like them, almost entirely used in the building up of the tissues, its role being essentially plastic.

As to sulfur, it is bound in part in the proteins to the nonmetals mentioned, but in the form of cysteine, glutathione, etc., it also acts as a catalyzer in the cellular reactions. Thus, directly or indirectly, it participates in the synthesis of vegetable matter and consequently in the assimilation of nitrogen.

The sulfur/nitrogen ratio varied significantly according to plant species.

The data presented furnish primary leads as to the proportions of sulfatic fertilizers needed to assure an adequate nitrogen assimilation and normal growth.

Physiological studies in plant nutrition.—IV, Nitrogen metabolism in relation to nutrient deficiency and age in leaves of barley, F. J. Richards and W. G. Templeman (*Ann. Bot.* [*London*], *50* (*1936*), *No. 198*, *pp. 367–402*).—Continuing this series[1] (E. S. R., 63, p. 132), barley was grown in sand culture with complete nutrients and with deficiency of nitrogen, phosphorus, and potassium, respectively, and leaf samples were taken on eight selected dates during the vegetative period.

Differences in the composition of the successive leaves at the time of emergence and in the changes occurring as they aged were observed. In general, total nitrogen and most of the estimated fractions rose to a maximum in leaves 2 to 4, declined to a minimum at leaf 8 or 9, and the last leaves again showed a rise. Nitrogen content fell continuously with age in the earlier leaves, but in the later ones it rose for some time after expansion. These changes are discussed in relation to the amounts of available nitrogen at different periods. Differences in nitrogen level induced by its deficiency were very marked, but there was little indication of departure from the usual protein cycle and the

[1] Ann. Bot. [London], 43 (1929), No. 169, pp. 119–161, figs. 16; 46 (1932), No. 182, pp. 367–388, figs. 7.

observed fractions bore much the same relations to one another as in high-nitrogen plants.

Large differences were found with phosphorus deficiency, protein being reduced even in the early stages of the leaf development and rapidly declining with age. The most marked characteristic was a greatly increased concentration of amide. The inability to synthesize adequate amounts of protein is held to be the primary cause of the similarity in many of the symptoms of phosphorus and nitrogen deficiency, in both cases leading to low meristematic activity as indicated by a reduction in rate of tillering and leaf production and in size of leaf.

The main effects of potassium deficiency on the various fractions were a very rapid disappearance of protein with age of leaf, a marked increase in amino and amide nitrogen, and an accumulation of nitrate in the later leaves. A hypothesis is presented that potassium is not primarily connected with protein synthesis but is in some way essential to the maintenance of the protoplasmic complex, and that in its absence protoplasm breaks down rapidly, leading to very early death of the leaves. Consequently, protein is rapidly hydrolyzed and simpler nitrogenous substances accumulate throughout the plant.

The relation of nitrogen supply to aging of the leaf and the observed accumulations of nitrate associated with phosphorus and potassium deficiency are discussed, and a possible relation between reductase activity and amino acid concentration is indicated.

Influence of the chloride ion on the content of chlorophyll in the leaves of potatoes, S. BASSLAVSKAYA and M. SYROESHKINA (*Plant Physiol., 11 (1936), No. 1, pp. 149–157, fig. 1*).—Leaves of plants grown under field conditions contained from two to three times as much chlorophyll as those from pot cultures. The action of chlorides on the total crop and on the water and chlorophyll contents of the plants was more sharply expressed in the field than in the pot experiments. The lower chlorophyll content of the fresh leaves of plants receiving high dosages of chloride-containing fertilizers at early developmental stages was conditioned by an increased water content in those plants. The actual reduction in chlorophyll content of plants rich in chlorine occurred only at the end of the vegetative period.

Number of chlorophyll molecules acting as an absorbing unit in photosynthesis, H. I. KOHN (*Nature [London], 137 (1936), No. 3469, p. 706*).—Using *Chlorella pyrenoidosa* as a test plant, it appeared that 360 chlorophyll molecules comprised an absorption unit within the plant. In this sense, the unit is taken to mean a mechanism making available the energy of an absorbed quantum.

Factors influencing germination and development of dormancy in cocklebur seeds, N. C. THORNTON (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 477–496, figs. 5*).—The upper and lower seeds of cocklebur (*Xanthium canadense*) (intact seeds and naked embryos) required a lower partial pressure of oxygen for germination as the temperature was increased from 21° to 30° C. Germination of the intact, imbibed upper seeds occurred in 20 percent of oxygen only at 33° or above, but it could be forced at 25° with from 80 to 100 percent of oxygen. In the germination of intact seeds in oxygen, growth of the cotyledons precedes that of the radicle—the reverse of the normal process. Imbibed, intact upper seeds germinated normally at 25° with as little as 10 percent of oxygen, provided the carbon dioxide (CO_2) concentration was high. Germination of imbibed, intact lower seeds was hastened by holding in from 10 to 40 percent of CO_2 with 20 percent of oxygen. In 20 percent of oxygen no concentration of CO_2 inhibited germination of intact seeds for more than 31 hr. The bur played no basic part in the delayed germination of the upper seeds in nature.

Dormancy was induced in the embryos of the upper and lower seeds by holding intact seeds in atmospheres lacking oxygen but composed of nitrogen, hydrogen, CO_2, or various mixtures of CO_2 and nitrogen for from 4 to 16 weeks at from 28° to 31°. Subsequent storage on moist cotton in Petri dishes for a similar time and temperature lengthened the dormant period thus induced. Dormancy-inducing atmospheres of this kind were rendered much less effective if as little as 1 percent of oxygen was present. Held in the various gas mixtures minus oxygen at 21° only a partially dormant condition was induced. Partial dormancy was also induced in the embryo of intact upper seeds by storage in soil or sand at 27° or above.

During the treatment for dormancy in the embryo the catalase activity was lowered. The dormancy of embryos induced by gas treatment was overcome by 3 mo. of moist storage of intact seeds at 5°. The gas treatments for dormancy act on the embryo itself, since such seeds failed to grow even after removal of the seed coat. The subsequent growth of some embryos with gas-induced dormancy was comparable to the growth of seeds having dormant embryos at harvesting time. The seedlings developing from the dormant embryos showed dwarfing, leaf curling, and slow growth for from 2 to 5 weeks, followed by a period of normal growth.

Dormancy in seeds of Benzoin aestivale L., E. M. Schroeder (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 411–419, figs. 2*).—"Optimum temperatures for germination of *B. aestivale* L. in the ovens were daily alternations of 10° to 30° C. and 10° to 20°, which gave 88 and 70 percent, respectively.

"Four mo. in moist, granulated peat at 5° or 10° before planting in the greenhouse resulted in a very good stand of seedlings. The rate of seedling production and the total percentage were increased when the seeds were subjected to 1 mo. at 25° followed by 3 mo. at 1°, 5°, or 10° before planting. Two and 3 mo. at 25° were no more effective. If, however, the seeds were subjected to only 2 mo. at low temperature, at least 4 mo. at 25° preceding it were necessary.

"The mulched frames gave better results than the board-covered frames. The effectiveness of the latter was greatly increased when preceded by 1 mo. in the 21° greenhouse. Seedlings can be produced on a large scale by planting the fresh seeds outside in the fall and mulching them over the winter with no danger of losing seedlings under the mulch because of early germination. If fall plantings are not possible, seeds can be placed for 4 mo. in a refrigerated room (5° or 10°) in a moist medium before planting in the spring."

The physiology of Indian nodule bacteria, G. Palacios and A. Bari (*Indian Acad. Sci. Proc., 3 (1936), No. 4, Sect. B, pp. 334–361, pls. 6*).—The physiological reactions of Indian nodule bacteria isolated from *Cajanus indicus*, *Dolichos biflorus*, and *Psophocarpus tetragonolobus*, respectively, were studied and are here reported. With the nodule bacteria from *C. indicus* another organism was constantly associated, which is described in another paper (see next abstract). Each of the three strains of nodule bacteria produced nodules on all three hosts, but the associated organism produced none. The nodule organism of *C. indicus* has been placed by various authors in the cowpea group, but the authors' strain is said to differ in giving an acid reaction in litmus milk and mixed reactions in sugar media. Methods of culturing both the nodule bacteria and their hosts are discussed.

A new micro-organism associated with the nodule-bacteria in Cajanus indicus, G. Palacios and A. Bari (*Indian Acad. Sci. Proc., 3 (1936), No. 4, Sect. B, pp. 362–365, pl. 1*).—"A new organism (*Bacillus concomitans* n. sp.) is described which is found frequently inside the nodules formed in *C. indicus*.

When isolated in pure culture it does not produce nodules, it gives a Congo-red negative reaction, and possesses many other characteristics which differentiate it from *Rhizobium radicicola* and *R. radiobacter*."

The influence of certain fungi on the sporulation of Melanospora destruens Shear and of some other Ascomycetes, R. P. ASTHANA and L. E. HAWKER (*Ann. Bot.* [*London*], *50* (*1936*), *No. 198, pp. 325–343, pl. 1*).—Perithecium formation by *M. destruens* was markedly influenced by the composition of the media used, and sporulation of this and some other Ascomycetes was stimulated by the presence in the cultures of certain other organisms (e. g., *Helminthosporium, Cunninghamella, Botrytis*, or *Penicillium*) or their derivatives.

It is concluded that the intensity of sporulation in a "staled" medium is determined by a combination of three factors, viz, a reduction in food concentration by the organism used as the staling agent, the production by the latter of inhibitory substances, and also the production of a substance or substances stimulatory to perithecial formation and which are formed only slowly by *M. destruens* itself.

Molasses-agar: A useful medium for the cultivation of the genus Monilia, H. A. KEMP and S. HABERMAN (*Field and Lab.*, *3* (*1934*), *No. 1, pp. 5, 6*).—Culture tests with *Monilia* spp. on various media indicated best results with a nutrient broth or agar containing "sorghum" molasses (formulas given). It also proved excellent for various common molds (especially those affecting fruit and grain) and for the isolation and culture of fungi of the *Epidermophyton* and *Trichophyton* groups.

Changes in sea water in relation to the rankness of Zostera growth [trans. title], S. ISHIDA (*Bot. and Zool.* [*Tokyo*], *3* (*1935*), *No. 3, pp. 613–616, figs. 10*).—The relations of pH, oxygen saturation, and temperature are considered, the text being in Japanese.

GENETICS

[Genetic studies by the Vermont Station] (*Vermont Sta. Bul. 407* (*1936*), *pp. 29, 30, 32*).—A brief account is presented of breeding and cytological studies with *Viola* species and hybrids and on the growth of pollen tubes in cross- and self-fertilized flowers of the pear.

Chromosome behavior in Agrostis nebulosa, F. W. TINNEY (*Bot. Gaz.*, *97* (*1936*), *No. 4, pp. 822–833, figs. 24*).—This is a contribution by the University of Wisconsin.

Chromosome numbers and electrophoresis of latex in Asclepias, L. S. MOYER (*Bot. Gaz.*, *97* (*1936*), *No. 4, pp. 860–865, figs. 7*).—This is a contribution by the University of Minnesota.

Chromosome numbers in the Malvaceae, I, A. SKOVSTED (*Jour. Genet.*, *31* (*1935*), *No. 2, pp. 263–296, figs. 125*).—The chromosome numbers of about 120 species representing 25 genera of Malvaceae are described. The chromosome numbers found were 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 25, 26, 28, 33, 35, 36, 38, 39, 42, 46, 56, and 65. The evidence presented favors the following chromosome series: A 5 series (5, 10, 15, 25), a 6 series (12, 18, 36), a 7 series (7, 14, 21, 28, 35, 42, 56), an 11 series (11, 22, 33), and a 13 series (13, 26, 39, 65). In most genera, all species examined are members of the same chromosome series, i. e., *Althaea, Pavonia*, and *Gossypium*. Some genera, however, contain different chromosome series, i. e., *Abutilon* (8 and 7 series), *Malvastrum* (12 and 15 series and a few numbers represented by a single specimen), and *Hibiscus* (11, 12 (18, 36), 14 (28), 17, 19, and several others). The

cytological groups in these genera appeared to be associated with taxonomical groups or certain morphological characters.

The chromosomes of Sphaerocarpos cristatus, C. E. Allen (*Bot. Gaz. 97 (1936), No. 4, pp. 846–853, figs. 21*).—This is a contribution by the University of Wisconsin.

A study of the appearance of awn characters in a cross between Meloy and Faust barley, C. A. Michels (*Amer. Nat., 70 (1936), No. 726, pp. 13–18*).—The F_1 progeny of the cross between Meloy barley (probably a field hybrid between the hooded naked Nepal and the awned hulled Coast barley) and Faust (a hooded selection from the awned naked Himalaya), were all hooded, while the F_2 segregated into hooded and awned in about a 3:1 ratio and the awned segregates could be grouped as rough- and smooth-awned, also in a 3:1 ratio. This contribution from the Idaho Experiment Station also suggests genetic formulas for the parents and segregates.

A correlated study of the inheritance of seed size and botanical characters in the flax cross, Redwing×Ottawa 770B, W. M. Myers (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 623–635*).—The mode of inheritance of petal color, seed color, cilia on the false septa of the bolls, and seed size were studied at the Minnesota Experiment Station in the above cross. Redwing has light-blue flowers, small brown seed, and cilia on the margins of false septa, whereas Ottawa 770B has white flowers with narrow inrolled petals, medium large yellow seed—larger than that of Redwing, and nonciliate false septa.

White petal color behaved as a simple recessive to blue, although a deficiency occurred in the recessive class. About 33.8 percent of the possible white-flowered segregates failed to reach the flowering stage, and lower viability of mature seed, or of plants before flowering, or of both could account for a deficit of 21.9 percent of the recessives. Color in the seed coat depended upon the same gene-determining production of color in the petals or upon a gene closely linked with the flower color gene. A single factor pair differentiated the two varieties with intermediate dominance for production of cilia on the false septa, this gene being inherited independently of the petal color gene. Seed size depended upon multiple factors, undetermined in number. Large seed size was partially dominant over small. The weight per 50 seeds of the F_2 plants and the mean weight of their F_3 progeny were correlated, $r=0.684$. Linkage was not demonstrated between major seed size genes and genes responsible for petal color and cilia on the false septa.

Studies in Indian chillies.—IV, Inheritance of pungency in Capsicum annuum L., R. B. Deshpande (*Indian Jour. Agr. Sci., 5 (1935), No. 4, pp. 513–516, pl. 1*).—In continuation of this series (E. S. R., 69, p. 639) observations on seedlings resulting from crosses made between two strains which had been selected for pungency and absence thereof showed the F_1 generation to be pungent to a moderate degree, thus suggesting that pungency is dominant over nonpungency. Segregation in the F_2 followed closely the expected 3:1 basis. The results suggested that pungency in chilies is a simple monogenic character.

Notes on Cucurbita moschata, Duch., A. T. Erwin (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 213–216, pls. 3, fig. 1*).—Observations by the Iowa Experiment Station on inbred lines showed no reversion to other species, indicating definitely that the theory of hybrid origin for *C. moschata* is untenable. The fact that *C. moschata* has maintained its identity from pre-Columbian times to the present despite abundant opportunity for crossing indicates also rather closely defined species lines. In discussing the botanical characters of the species the author points out that there are two important constant characteristics, namely, the fimbricated or threadlike wavy margin of the seed and the tomentum of the vines and leaves.

A frequently mutating gene in the pineapple Ananas comosus (L.) Merr., J. L. Collins (*Amer. Nat., 70 (1936), No. 730, pp. 467–476*).—Observing that spiny-leafed types continue to appear in the Cayenne variety of pineapple in Hawaii despite considerable rogueing, the author computed the percentages of chimeras, that is, plants with occasional spiny leaves, in clonal populations and in a hybrid population produced by crossing smooth and spiny-leafed types. The much higher percentage of chimeras observed in the hybrid population is ascribed to the fact that a portion of the usual Cayenne population does not produce chimeras, that is, it is homozygous for the smooth-leafed character. The rate of mutations from smooth to spiny in the pineapple, namely, 4.95 percent, places this character in the category of frequently mutating or unstable genes.

Cytology and fruit breeding.—V, The cultivated fruits, B. R. Nebel (*Farm Res. [New York State Sta.], 3 (1936), No. 1, p. 13*).—This, the fifth in a series of popular discussions (E. S. R., 75, p. 608), presents information on the number of chromosomes in different species and varieties of cultivated fruits, pointing out the relationship between the complement of chromosomes and self-fruitfulness and the probable role of polyploidy in the creation of some of the cultivated species.

The inheritance of acquired characters and the provisional hypothesis of pangenesis, C. Zirkle (*Amer. Nat., 69 (1935), No. 724, pp. 417–445*).—A review of early biological views on the inheritance of acquired characters and the hypothesis of pangenesis as explained by Darwin.

A review of genetic studies on the transplantation of tumours, J. J. Bittner (*Jour. Genet., 31 (1935), No. 3, pp. 471–487*).—In attempts to transplant tumors in mice, 33 tumors have been inoculated into inbred and hybrid strains. Evidently segregation of tumor susceptibility occurs, but mutations in the genetic constitution of the tumor and the host are complicating factors.

[Papers on dairy cattle genetics] (*Jour. Dairy Sci., 19 (1936), No. 7, pp. 428–432, 448–450, 450–452, figs. 2*).—Brief abstracts are given of the following papers of genetic interest which were presented before the 1936 annual meeting of the American Dairy Science Association: Relative Genetic Worth of Partial Lactation Records of Various Lengths, by W. L. Gaines (p. 428, 429); Heritability of Butterfat Percentage and Butterfat Production in the Data With Which Sires Have Been Proved in Iowa, by J. L. Lush and E. N. Shultz (p. 429, 430); Some Results of Eighteen Years of Close Breeding With Jerseys, by W. M. Regan, S. W. Mead, and P. W. Gregory (p. 430, 431); Evaluating Inheritance for Type From Grades Recorded in the Germ Plasm Survey, by W. W. Swett (p. 431); Some Additional Findings of the Dairy Cattle Germ Plasm Survey, by M. H. Fohrman (p. 431, 432); Galactin Content of Pituitaries, by R. P. Reece and C. W. Turner (pp. 448, 449); Bovine Ovarian Reactions to Various Gonadotropic Hormone Preparations, by L. E. Casida (pp. 449, 450); and Effect of Hypophysectomy on Development and Function of the Mammary Gland, by E. T. Gomez and C. W. Turner (pp. 450–452).

The occurrence of polythelia in dairy cattle, W. Gifford (*Jour. Dairy Sci., 17 (1934), No. 8, pp. 559–569, figs. 4*).—Three types of supernumerary teats were studied in 4,831 female and 135 male dairy cattle at the Missouri Experiment Station. These were designated as caudal (rear of normal teats), intercalary (between normal teats), and ramal (ramifications or branches of normal teats). The polythelial condition was observed in 25.8 percent of the 4,831 females and 14.07 percent of the 135 males.

Data on the subject obtained by other workers are compiled.

The inheritance of semi-hairlessness in cattle, W. A. Craft and W. L. Blizzard (*Jour. Heredity, 25 (1934), No. 10, pp. 384–390, figs. 2*).—A condition of semi-hairlessness in Polled Hereford cattle which seemed to be inherited as a single recessive is noted from the Oklahoma Experiment Station.

Birth-weight, gestation period, and sex ratio of Alaskan hybrid Holstein-Galloway calves, W. T. White (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 709–716, figs. 5*).—Data are presented on the 116 F_1, F_2, F_3, F_4, and F_5 calves produced in the Holstein-Galloway herd of the Alaska College Experiment Station. The average gestation period was 282.9±3.2 days and the average birth weight 87.9±8.2 lb. No significant differences were noted in the sex ratios.

Color inheritance in Galloway-Holstein crosses, W. T. White and H. L. Ibsen (*Jour. Heredity, 26 (1935), No. 2, pp. 75–84, figs. 21*).—An analysis of the inheritance of contrasting color characters as observed in successive generations of the cross-bred Galloway-Holsteins produced at the Alaska College Experiment Station showed that a large number of Galloways are heterozygous selfs (*Ss*). Galloways also carry two dominant modifiers of white spotting, one, *Wr* (white-restricter), is present in most animals, and the other, *Pl* (pigmented-leg), is more rare.

Some blood elements in the hybrids of yaks with horned cattle [trans. title], F. S. Kozharin (Th. S. Kosharin) and G. V. Samokhvalova (G. W. Ssamochwalowa) (*Biol. Zhur., 3 (1934), No. 3, pp. 513–532, figs. 2; Ger. abs. pp. 530–532*).—A study of 170 animals of various ages involving yaks, domestic cattle, and hybrids showed a definite weight increase in the hybrids from an average of 233 kg. for yak cows and 246 kg. for domestic cows to 325 kg. for the hybrids. Effects of heterosis were also shown in a significantly higher hemoglobin content of the blood and larger erythrocytes in the hybrids than were exhibited in either of the parents. Two back-cross animals showed still higher hemoglobin content in the blood.

The trek of the golden fleece, R. H. Burns and E. L. Moody (*Jour. Heredity, 26 (1935), Nos. 11, pp. 433–443, figs. 7; 12, pp. 505–518, figs. 4*).—Development of the use of sheep in ancient times with special reference to Merinos in Spain and the Mele type, a mutton Merino having its origin in a cross between the Merino and Border Leicester, is described. Finally, more recent developments of Merino and fine wool breeding in the various parts of the world and in America in more modern times are discussed.

Genetic aspects of the Danish system of progeny-testing swine, J. L. Lush (*Iowa Sta. Res. Bul. 204 (1936), pp. 105–196, figs. 27*).—A brief summary of the history of the Danish system of progeny testing of swine leading up to a description of the plan in operation, with about 250 State recognized swine breeding centers, privately owned but under partial supervision of a committee representing farmers' organizations and cooperative bacon factories, 5 official progeny testing stations, and 15 local stations for slaughter tests.

The rules and regulations governing the testing with changes in conformation, quality, gains, etc., made since testing began in 1907 are discussed.

A statistical analysis was made of the variance within litters for five different characteristics in attempting to determine the relative influence of heredity and environment and the dependability that might be placed on the results based on testing different numbers of pigs from a litter. Less than one-half of the individual variance in the characteristics could be attributed to the additive gene effects, but the method has served the Danish farmer well and there seems to be evidence that distinct changes may occur in the population for at least a few more generations.

Is fecundity in swine inherited? L. A. Henke (*Jour. Heredity, 26 (1935), No. 11, pp. 455, 456*).—Correlations calculated between the litter size in which dams or sires were born and size of litter produced in 89 Tamworth and 71 Berkshire litters at the Hawaii Experiment Station were for sires in the Tamworth and Berkshire litters, respectively, 0.048±0.07 and 0.220±0.08, and for dams, 0.166±0.07 and 0.221±0.008.

Inheritance of cryptorchidism in swine, H. C. McPhee and S. S. Buckley (*Jour. Heredity, 25 (1934), No. 8, pp. 295–303, figs. 2*).—The occurrence of cryptorchidism in an inbred line of Chester Whites in the Beltsville herd of the U. S. D. A. Bureau of Animal Industry is noted. From the results, cryptorchidism in swine appears to be due to a single recessive Mendelian gene, sex limited in its expression. Bilateral cryptorchids are occasionally fertile.

Inheritance of rate of growth in domestic fowl.—III, Comparative rates of growth of Leghorns and Rocks, V. S. Asmundson and I. M. Lerner (*Poultry Sci., 13 (1934), No. 6, pp. 348–352*).—Continuing this series (E. S. R., 70, p. 462), an analysis was made of the growth rates of White Leghorns and Barred Plymouth Rocks from hatching to 24 weeks of age at the California Experiment Station. The most suitable age for studying genetic differences was considered to be between the second and eighth weeks of age.

Statistical studies on the inheritance of rate of laying in White Leghorns and Rhode Island Reds, A. B. Godfrey and M. A. Jull (*Poultry Sci., 15 (1936), No. 1, pp. 63–66*).—A statistical study of the rate of laying of White Leghorns and Rhode Island Reds at the National Agricultural Research Center, Beltsville, Md., showed that the daughters of different sires or daughters of different dams with the same sires differed significantly in their rate of production. More closely related birds laid more nearly at the same rate than more distantly related ones. All results pointed toward the fact that rate of laying behaved as an inherited character.

"Sporadic flightless" fowls, R. L. Mayhew (*Jour. Heredity, 25 (1934), No. 10, pp. 409, 410, figs. 2*).—The occurrence in a Rhode Island Red flock of two birds lacking flight feathers is noted from the Louisiana Experiment Station. The condition did not appear to be hereditary.

A dwarf mutation in the rat, W. V. Lambert and A. M. Sciuchetti (*Jour. Heredity, 26 (1935), No. 2, pp. 91–94, figs. 2*).—Dwarf rats, less thrifty than normals and sterile, were produced at the Iowa Experiment Station. There were 22 dwarfs among 102 young produced, suggesting that the dwarf condition is due to a single recessive autosomal gene.

The butterfat records of cows possessing supernumeraries compared with cows having the normal number of teats, W. Gifford (*Jour. Dairy Sci., 17 (1934), No. 8, pp. 571–573*).—In the studies at the Missouri Experiment Station, butterfat records of 1,081 cows of several breeds did not show any consistent relation to the presence or absence of supernumerary teats.

Variation in the development of embryos of hens' eggs, E. H. McNally and T. C. Byerly (*Poultry Sci., 15 (1936), No. 4, pp. 280–283, figs. 4*).—In studies at the National Agricultural Research Center, Beltsville, Md., the relation of the development of the embryo when the egg is laid to hatchability was determined by counting the somites in the embryos of eggs incubated for 48 hr. immediately after laying. Hatching percentages were determined for eggs from the same hens. The maximum average number of somites and maximum hatchability were obtained from eggs with an interval of 27 hr. between the time of laying. The hatchability of eggs with a longer interval was rapidly reduced. The relation of egg weight to embryo development was also evident.

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FIELD CROPS

[Field crops production and utilization] (In *Proceedings of the Second Dearborn Conference of Agriculture, Industry, and Science, Dearborn, Mich., 1936. Dearborn: Farm Chemurgic Council, 1936, pp. 37–47, 62–65, 111–120, 141–151, 154–158, 170–176, 184–192, 205–211, 243–264, 287–304, 315–322, pls. 5, figs. 6*).—Papers of interest to agronomists presented at the meeting at Dearborn, Mich., May 12–14, 1936, include Organo-Phosphates as Potential Fertilizers, by R. Stewart (pp. 37–47) (Nev.); Perilla and Other New Oil Crops, by H. A. Gardner (pp. 62–65); Growing Artichokes in America, by W. L. Burlison (pp. 111–120) (Ill.); Products of Corn, by M. Sayre (pp. 141–148); The Iowa Corn Research Institute, by R. M. Hixon (pp. 149–151) (Iowa); Solvents From the Farm, by C. L. Gabriel (pp. 154–158); Industrial Utilization of Oat Products, by F. N. Peters, Jr. (pp. 170–176); Whole Cotton as a Source of Oil and Alpha-Cellulose, by F. K. Cameron (pp. 184–192) (N. C.); The Chemistry of Cellulose, by W. K. Farr (pp. 205–207); The Industrial Utilization of Sugar Cane Fiber, by T. B. Munroe (pp. 207–211); Soy Beans as a Farm Crop, by E. D. Funk (pp. 243–247); The Processing of Soy Beans, by C. Bradley (pp. 248–250); The Rôle of Soy Bean Oil in Paint Formulation, by E. E. Ware (pp. 250–254); Soy Bean Proteins, by W. J. O'Brien (pp. 254–260); Soy Bean Chemistry, by H. R. Kraybill (pp. 260–264) (Ind.); Progress in the Manufacture and Use of Fertilizers, by F. E. Bear (pp. 287–292); Pyrethrum—a New Crop, by R. E. Culbertson (pp. 292–297); The Relation of Insecticides to Plant Growth, by D. M. DeLong (pp. 297–304) (Ohio); and The Application of Physics to Agriculture, by G. R. Harrison (pp. 315–322).

[Forage crops investigations in Wales] (*Welsh Jour. Agr., 12 (1936), pp. 120–130, 136–182, 192–204, figs. 8*).—Further experiments (E. S. R., 73, p. 602) with forage crops, meadows, and pastures, conducted in Wales, are reported in articles entitled The Lamb Fattening Capacity of Certain Crops for Hill Conditions (pp. 120–126) and The Wintering of Sheep on Temporary Grasses (pp. 126–130), both by M. Griffith and P. M. G. Hutton; The Influence of Management on the Chemical Composition of Pastures in Winter, by T. W. Fagan (pp. 136–139); Pasture Management and Its Effect on the Sward—III, A Poor *Agrostis* Pasture, by L. I. Jones (pp. 139–157); The Effect of Shoot Cutting on the Growth of Root and Shoot of Perennial Rye-Grass (*Lolium perenne* L.) and of Timothy (*Phleum pratense* L.), by R. A. Roberts and I. V. Hunt (pp. 158–174); Vegetative Vigour and the Possibility of Natural Cross-Fertilisation in Soft Brome, *Bromus hordeaceus* L. (*B. mollis* L.), by A. R. Beddows (pp. 174–182); Gall Midges Affecting Grass Seed Production in Mid-Wales, by D. P. Jones (pp. 192–197); and The Control of Gall Midges Affecting Seed Production in Grasses, by G. Evans and D. P. Jones (pp. 198–204).

Influence of reseeding and fertilization on growth and composition of pasture and hay plants (*Vermont Sta. Bul. 407 (1936), p. 19*).—Experiments as to the best time to seed four pasture clovers, alfalfa, timothy, Kentucky bluegrass, and orchard grass are briefly noted.

Investigations on the improvement of hill grazings (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 14 (1930–1935), pp. [5]+86*).—Papers included are entitled Investigations on the Improvement of Hill Grazings: The Scope of the Work, by R. G. Stapledon (pp. 1–3), which list 29 pertinent references; The Introduction and Maintenance of Nutritious and Palatable Species and Strains, by M. T. Thomas (pp. 4–57); and The Buried Viable Seeds of Enclosed and Unenclosed Hill Land, by W. E. J. Milton (pp. 58–86). Milton's article reports on an extension of work noted earlier (E. S. R., 72, p. 45),

made to the fields and sheep walks of certain hill farms including types ranging from enclosed fields to open hill swards and woodlands. Species providing the largest quantity of buried viable seed were generally the same in both experiments. A characteristic of the species was for relatively small quantities to predominate over large quantities of the buried seeds. No quantitative relation was evident between the composition of herbage and buried seed flora of young turf, although some agreement existed in older turf and definite agreement in hill turf of the *Festuca-Agrostis* class. Of sown species, much seed of *Poa trivialis* and *Trifolium repens* occurred in field soils but rather little *Cynosurus cristatus* and *Lolium perenne*. That certain grasses depend chiefly upon vegetative reproduction in maintaining their stands and certain others mainly on seed was confirmed. On the wetter slopes and marshes more buried seed of *Agrostis* spp. and *F. ovina* than of *Nardus stricta* and *Molinia caerulea* occurred, although the composition of the herbage was the reverse.

A survey of the pastures of Australia: Embodying ecological information and discussions explanatory of the accompanying pasture map of the Commonwealth, A. McTaggart (*Austral. Council Sci. and Indus. Res. Bul. 99 (1936), pp. 71, pls. 10, fig. 1, map 1*).—A map showing the classification of the pasture areas of the Commonwealth is accompanied by descriptions of the zones, from the seaboard with high rainfall to the interior basin with low and intermittent precipitation. Major zones recognized include tropical and southern open and northern and southern close forest grazing areas, northern and southern rain forests, alpine pastures, northern and southern open grassland zones, acacia and mallee scrub areas, saltbush and mulga type (semiarid to arid) areas, and the vast central-interior low rainfall zone of scattered sand hills and intervening clay plans. Secondary zones include permanent (exotic) and temporary (mostly exotic) pastures.

An introduction to the grasses of New Zealand, H. H. Allan (*New Zeal. Dept. Sci. and Indus. Res. Bul. 49 (1936), pp. 159, figs. 103*).—The genera and chief species of grasses occurring in New Zealand are described and illustrated, with appropriate keys, together with descriptions of the grass plant and its organs; useful aids to identification; and brief discussion of classification, grasslands of New Zealand, and polymorphy in grasses. A glossary, a bibliography (38 references), and an index to species and genera are appended.

Thirteen years' results with cover crops, G. G. Pohlman and H. O. Henderson (*West Virginia Sta. Bul. 275 (1936), pp. 12*).—The merits of several cover crops were determined, 1922–34, in a 2-yr. rotation of corn and soybeans. Since the experiment was made on level land, the results show only the effects due to reduction of losses by leaching and the increase in available plant nutrients.

Yields of both corn silage and soybean hay were increased by rye, rye and vetch, and vetch. Due to severe winters, crimson clover and sweetclover did not make satisfactory cover crops in this rotation. All the soils showed some decrease in total nitrogen but they were without significant differences in nitrogen content at the end of the experiment. It is pointed out that cover crops alone cannot in any sense replace lime and fertilizer.

Cover crops for soil conservation, W. V. Kell and R. McKee (*U. S. Dept. Agr., Farmers' Bul. 1758 (1936), pp. [2]+14, figs. 11*).—Legumes, grasses, and other crops considered suitable for use as cover crops for soil conservation are noted with their adaptations, brief cultural suggestions, and discussion of the merits and possible disadvantages of a cover crop.

Field stacking for Michigan beans, H. R. Pettigrove (*Michigan Sta. Spec. Bul. 276 (1936), pp. 18, figs. 12*).—Practical information is given on the methods of field stacking of beans to minimize percentage of pick or culls and on

curing beans in small bunches and in field stacks. The pick in Michigan beans, 1914–34, averaged 8.16 percent. Such cull beans are caused by disease, insect injury, improper handling, and unfavorable weather. The most critical period for the bean crop as to quality is from September 1 to 15, during which period the bulk of the Michigan crop is usually harvested. Varieties differ in pick under comparable growing and harvest conditions, Robust excelling because of disease resistance and its heavy vine growth which tends to keep the pods off the ground. Curing beans in windrows or in small bunches that must be turned after wet weather results in a very heavy pick when weather is unfavorable, whereas curing beans in well-constructed field stacks eliminates much of the weather hazard at harvest. Advantages of field stacking, commonly called the McNaughton system (E. S. R., 56, p. 826), are indicated, with precautions to be observed in its use.

The relation between bushel weight and maturity in corn, W. H. Leonard (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 928–933, fig. 1*).—That bushel weight may serve as an index of maturity was indicated by results obtained at the Colorado Experiment Station in 1931–33 with Golden Glow (3 yr.) and Pride of the North corn (2 yr.), harvested at 10-day intervals, August 22–October 1. The individual-ear bushel weight determinations made agreed with results obtained with the standard bushel weight tester. The air-dry and oven-dry weights per 100 kernels increased markedly with successive dates of harvest until maturity, after which they remained practically constant.

Cotton varieties and related studies, N. I. Hancock (*Tennessee Sta. Bul. 158 (1936), pp. 46, figs. 11*).—Variety and strain trials with cotton, 1928–34, at Jackson, Murfreesboro, and Knoxville are summarized, together with results of miscellaneous studies concerned with factors associated with earliness, environmental influences on lint quality, the cotton flower and its relation to varietal purity, seed structure as related to lint and byproducts, fiber properties, breeding a variety for adaptation to an environment, and on planting-seed.

Stoneville 2, Delta and Pine Land 11 and 10, Delfos 719, and Acala 44–5 are recommended, and recent strains of Trice may be used in the northern border of Tennessee. Prolific types have outyielded nonprolific western types, and late maturing varieties are not safely planted in Tennessee. Some observations drawn from the other studies are as follows:

The most active blooming period is between July 22 and August 24. Early bolls mature in less time than later ones. Better grades are generally obtained from September and October pickings. The length of lint is affected by the moisture content of the soil, an abnormally dry season causing the lint to be shorter. Soils and fertilizers have little influence upon the length of lint, except as they may concern the moisture supply. A combination of factors within the region may affect the lint. A range of fiber lengths is typical of all varieties. The cotton flower is self-fertilized, as a rule, but under certain conditions a large percentage of crossing takes place. With proper storage, old seed will germinate well. Old seed carry less disease, and therefore are preferred for planting as long as viable. The strain number of a variety is important, and to assure purity seed for planting should be obtained from the originator of the strain.

Length-diameter relationships in cotton fiber, O. A. Pope (*Arkansas Sta. Bul. 327 (1936), pp. 22, figs. 11*).—The relationship between fiber diameter and length of fiber within a sample was studied in Arkansas 17, Delfos 531, Rowden 2088, and Half & Half cotton grown at the station in 1933–34. These cottons represent lengths of staple commonly grown in the major part of the Cotton Belt. In field sampling, one lock was picked from each of 100 plants selected at random from the plats.

In general, varietal differences have been demonstrated in the length-diameter relationship in sorted samples of cotton fiber. Seasonal differences, to a certain extent, can modify the relationship within the same variety. However, these differences average smaller than those between varieties, indicating that the genetic constitution of varieties is the primary factor controlling the length-diameter relationship. Two cases were found in which the maximum fiber diameter occurred in the medium length section of the fiber distribution. In Arkansas 17, this point was shifted slightly to the longer length, while in Delfos 531 the shift was somewhat in the direction of shorter length. Rowden 2088 exhibited a definite tendency for the maximum diameter to occur in the range of shorter lengths and a tendency for decreased diameter to accompany increase in length. In Half & Half there was evidence of a bimodal situation, with the largest diameter occurring in the substaple and a large diameter in the longer lengths.

Consideration of all data indicated a genetic basis for the length-diameter relationship, but that seasonal conditions can modify certain of these factors significantly. There is no generalized relationship between length and diameter in the fractioned sample of different varieties. The diameter-ratio indicated that within the same sample a distinct tendency exists for the larger fibers to have a greater proportional amount of secondary cell wall thickening than the smaller fibers. There seemed to be no well-defined relationship of diameter to mean length of the variety.

Crested wheatgrass in Montana: Comparisons with slender wheatgrass and brome grass, L. P. Reitz, M. A. Bell, and H. E. Tower (*Montana Sta. Bul. 323 (1936), pp. 53, figs. 15*).—Cultural and utilization experiments in which crested wheatgrass (*Agropyron cristatum*) was compared with bromegrass (*Bromus inermis*) and slender wheatgrass (*A. tenerum*), made at the Northern Montana (Havre) and Judith Basin (Moccasin) Substations in cooperation with the U. S. Department of Agriculture, are reported with descriptions of the three grasses and suggestions for growing and using crested wheatgrass. See also an earlier note (E. S. R., 67, p. 518).

Crested wheatgrass stands are obtained best by seeding on a relatively firm, moist, weed-free seedbed, e. g., on good summer-fallowed land supplied with moisture near the surface. Crested wheatgrass may be seeded in early spring (April 24–May 14) on a good seedbed; in early fall (September 1 to 15) mainly where fall-sown crops survive and do well; and in late fall (sometime in November) on poor preparation such as abandoned land, in stubble, and in old, thin stands of alfalfa, where low seeding cost is of primary importance. Satisfactory stands may be obtained by planting with a grain drill not deeper than 1.5 in. from 6 to 10 lb. of good seed per acre for close drills, from 2 to 4 lb. for single rows 36 in. apart, and from 3 to 5 lb. for double rows with the pairs spaced from 36 to 42 in. apart.

Row plantings of the three grasses produced greater average yields of hay than close-drilled seedings under the (dry) experimental conditions, whereas the reverse is usually true with more favorable moisture conditions. A nurse crop most noticeably depresses hay yields from the grasses the first year or two after seeding, and often causes failure in establishing stands. Flax has been less detrimental than wheat as a nurse crop.

Crested wheatgrass during 15 yr. of experiments at Moccasin averaged 1,861 lb. of hay per acre, bromegrass 1,776 lb., and slender wheatgrass 1,770 lb. The respective average yields during 14 yr. at Havre were 1,662, 1,186, and 1,736 lb. per acre. Crested wheatgrass has maintained productive stands for many years, has consistently outyielded bromegrass, and has withstood more extremely unfavorable conditions. Slender wheatgrass yields well the first 3 or

4 yr. after seeding, but is not dependable for permanent seedings. No significant increases in yields have resulted from seeding these three grasses together in various mixtures, and only slight increases came from sowing crested wheatgrass in mixtures with alfalfa. However, growing a few pounds of sweetclover with a permanent grass usually results in greatly increased forage yields the first year after planting.

Experiments at Moccasin showed that crested wheatgrass and bromegrass pastures have had from 2.5 to 3 times the carrying capacity of native grassland. Its permanence and high productive capacity recommend crested wheatgrass for pasture purposes on dry land. It sets seed abundantly both on dry land and under irrigation in Montana. Indications are that crested wheatgrass by virtue of its hardiness, aggressiveness, and seeding habits is well adapted to growing on much of the abandoned plowed farm land in Montana. Five to 10 yr. ordinarily will be needed to regrass an area if strip planted.

[**Potato production and research**] (*Ohio Veg. Growers Assoc. Proc., 21 (1936), pp. 107–116, 123–128, 130, 132, 134, 136, 138, 140, 142*).—Papers included in these pages which report station research are entitled New Varieties of Potatoes (pp. 107–111) and Experiments With Size of Cobbler Seed Pieces (pp. 138, 140, 142), both by J. Bushnell, and The Use and Value of Potatoes for Poultry Feeding, by D. C. Kennard (pp. 127, 128, 130, 132, 134, 136) (all Ohio), and Handling and Storage of Seed and Table Stock Potatoes (pp. 112–116) and The Relation of Soil Reaction to Yield and Market Quality of Potatoes (pp. 123–127), both by O. Smith (New York Cornell).

Variations in yield of pure line Green Mountain potatoes grown in a controlled environment, O. Butler (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 706–710; also New Hampshire Sta. Sci. Contrib. 49 (1936), pp. 706–710*).—Decided variations were observed in the yields and also the rankings of the progenies from 10-tuber units of Green Mountain potatoes grown for 3 generations at about 15° and 20° C., respectively, and also in the productiveness of tuber unit cultures grown for 6 and 7 generations at about 20°. Plants originating from tubers from the same hill showed as large variations in yield in 3 generations at 15° and 20° as plants derived from tuber units selected at random. Data on numbers of tubers produced per hill above 15 g in weight, secured in the test first mentioned, showed that, while in general, no relation existed between tuber set and yield, plants producing only 5 tubers never yielded highest, nor were they always and invariably least productive, and plants setting 10 tubers never made the lowest yield, but neither did they consistently outyield hills with 6, 7, 8, or 9 tubers. No evidence was obtained that tuber set is inherited. Conclusions were that to select seed from healthy stock on the basis of yield and tuber number is labor lost. All that is necessary to maintain productivity is to select from healthy hills of uniformly vigorous plants.

Report of the research committee on potato breeding, C. F. Clark (*Amer. Potato Jour., 13 (1936), No. 4, pp. 96–99*).—This report is intended to cover so far as possible the work of investigators in America and other countries relating to potato breeding, and is based largely on the publications of 1935 (13 titles listed). Cytological, genetic, and breeding studies, and work on resistance to frost, scab, late blight, and wart disease are included.

Earliness in the United Provinces rices, R. L. and B. L. Sethi and T. R. Mehta (*Indian Jour. Agr. Sci., 6 (1936), No. 2, pp. 361–376, figs. 2*).—Certain features of the rice varieties (E. S. R., 67, p. 239) are discussed, especially as to their maturity. In the early transplanted varieties the flowering period is affected by age of seedlings at transplanting, increased age resulting in

delayed flowering, but this was not a factor in the late varieties. Greatly delayed transplanting in certain early types resulted in precocious flowering. The ripening period in early varieties was shorter than in late varieties. Within the same group of varieties, early or late, the relation between flowering duration and ripening period was neither constant nor significant.

Non-saccharine sorghums, C. K. McClelland (*Arkansas Sta. Bul. 328 (1936), pp. 25, figs. 5*).—Varietal experiments with grain sorghums at the station, 1926–35, and at branch stations, 1931–35, are reported on with data on threshing percentages and forage yields and remarks on the characteristics and relationships of individual varieties.

Schrock led with an average of about 36 bu. per acre during the decade, and was followed by shallu with 34.3 bu. and milo and darso with 30 bu. each. Chiltex and strains of Schrock led at the branch stations, whereas shallu did not show the same superiority as at the station. No one variety consistently led the others in forage production. No adverse effects on crops succeeding sorghum were noted in the rotation, sorghum, soybeans or cowpeas, and oats or wheat in which clover is sown.

During the decade 1926–35, in which there were three very droughty seasons, certain standard corn varieties averaged 31.9 bu. and the better sorghums 33.9 bu. per acre. The gains in yield of the sorghum were hardly enough to overcome its discount in feeding value. The data indicated the value of sorghum as a supplement for corn in average seasons and as a good substitute in dry years.

Multiple seededness in sorghum and consequent repercussions, G. N. R. Ayyangar and V. P. Rao (*Madras Agr. Jour., 24 (1936), No. 1, pp. 15–18, pls. 2*).—The occurrence of multiple-seeded spikelets ranging from 2s to 6s in a wide range of material from India and Africa is described and illustrated, with remarks on the several types of proliferation and associated abnormalities of floral organs. See also an earlier note by Karper (E. S. R., 67, p. 520).

Cleistogamy in sorghum, G. N. R. Ayyangar, V. P. Rao, and T. V. Reddy (*Cur. Sci. [India], 4 (1936), No. 12, pp. 872–874, figs. 2*).—Cleistogamic heads of *S. papyrascens* had fewer fertile sessile spikelets and considerably more poorly developed and also more viviparous kernels than chasmogamic heads, and also had a number of antheriferous pedicelled spikelets. Cleistogamy is attributed to modifications of glumes and floral organs.

Floral abnormalities in sorghum, R. E. Karper and J. C. Stephens (*Jour. Heredity, 27 (1936), No. 5, pp. 183–194, figs. 3*).—The floral abnormalities in sorghum, described from cooperative studies by the Texas Experiment Station and the U. S. D. A. Bureau of Plant Industry, include spikelet shoots, scaly proliferation, antherless flowers, multiflorous, heritable twin seed, multiple-seeded spikelets, polyembryony, and fertile pedicelled spikelets. The inheritance of several of these is discussed briefly. Other abnormalities, apparently the development of extra structures rather than the modification of normal parts, include ovaries with three stigmas, four stamens in flowers, and extra bracts.

Cracked grains in sorghum, G. N. R. Ayyangar, V. P. Rao, and T. V. Reddy (*Cur. Sci. [India], 4 (1936), No. 12, p. 874, fig. 1*).—Cracked grains occurred in *S. kaffrorum*, *S. caudatum*, *S. rotundulum*, and *S. guineense*, the degrees of expression differing according to variations in seasonal conditions. Cracking so far was noted only in chalky grains and at the comparatively soft endosperm. Behavior of this character in crosses with normal grains was under study.

Leaf number of sorghum stalks, J. B. Sieglinger (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 636–642*).—Counts made at the U. S. Southern Great Plains Field Station at Woodward, Okla., 1932–33, showed the total number of leaves on the main stalk, including those formed during the seedling stage, to average for Dwarf milo 23.8, Beaver 22.7, Wheatland 18.3, and Fargo milo 24.2; feterita 20 and Spur feterita 24.1; Dwarf hegari 26.9; Ajax 22.5; Chiltex 21; Early Red kafir 21.3, Dawn 20.8, Sunrise 20.9, Reed 21.9, Sharon 21.2, Standard 23.3, and Bishop kafir 23.7; darso 19.3; Grohoma 23.6; and in 1933 only Club kafir 22.1, Hydro kafir 23.3, and Sooner milo 15.9 leaves per stalk. A range of from 5 to 10 leaves in the number on individual stalks within a variety was observed even when grown from selfed seed. Both season and planting date influenced the number of leaves of a given variety. Number of leaves and length of vegetative period were correlated $r=0.853\pm0.029$. The period between emergence and heading averaged 2.8 to 3.5 days per leaf for different varieties. The number of leaves or nodes also were closely related to size of leaf, forage yield, stem diameter, vigor, and stalk height. Early maturing sorghums have few leaves and consequently are limited in production.

Identification, history, and distribution of common sorghum varieties, H. N. Vinall, J. C. Stephens, and J. H. Martin (*U. S. Dept. Agr., Tech. Bul. 506 (1936), pp. 102, pls. 59, figs. 26*).—The botanical relationship of the genus *Sorghum* is indicated; the plant and its development are described; features of the characters used to describe varieties, including plant, stem, leaf, and panicle characters, glume characters of sessile spikelets, pedicellate spikelets, stigma color, and kernel characters, are pointed out; and an appropriate key for the identification of common sorghum varieties is provided. Descriptions, history, distribution, and synonymy are given for each common sorghum variety, and the acreage of important varieties is estimated by States. Foreign and American investigations relating to sorghum are reviewed with a list of 172 references to literature. An index to varieties and synonyms is appended.

Influence of steeping in solutions of varying hydrogen-ion concentrations on the germination and early growth of canes, B. N. Singh, S. C. Chakravarti, and Y. V. Rao (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 715–728, figs. 4*).—The effect of presoaking Co. 331 sugarcane in solutions of pH 2, 4, 6, 8, 10, and 12 for 24, 48, and 96 hr. upon the germination and growth of seedlings was studied at Benares Hindu University.

The differently treated sets varied both as to germination energy and dry-matter output, between which a positive correlation seemed to exist. The maximum growth occurred between pH 6 to 8. The best result was obtained for set root growth from the 48-hr. treatment, and the best shoot growths were exhibited by sets treated 24 hr. All treatments except 96 hr. showed an increase in production of dry matter over the control. In pH 6 for 24 hr. the increase was up to 115 percent. A greater conversion of sucrose into glucose and also a greater consumption of glucose under treatments giving the best growth were indicated. This greater conversion occurred near the neutral side of the reaction. The difference in behavior as to sucrose conversion in the differently treated sets could not be explained on the basis of hydrogen-ion concentration.

Flowering of Coimbatore canes in the United Provinces, H. N. Batham and L. S. Nigam (*Agr. and Livestock in India, 6 (1936), No. 1, pp. 25–42, figs. 3*).—Studies made at Cawnpore on a number of Co. varieties of sugarcane revealed that flowering tended to increase both tonnage of cane and quantity of juice. In sucrose content, flowered canes generally surpassed by more than 1 percent those not then in flower. Appreciably less glucose was found in the flowered

canes. A negative correlation was found between leaf area and the percentage weight of juice expressed. A consideration of meteorological data suggested that heavy rainfall combined with high temperature and humidity could induce arrowing in sugarcanes in northern India.

Fertilization of timothy meadows in the Upper Peninsula, J. Tyson (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 29–36, figs. 5*).—The hay yield from timothy meadows was increased remarkably and economically through applications of 400 lb. per acre of 10–10–5 and 10–6–4 fertilizer on Munising sandy loam, Longrie loam, and Iron River silt loam soils in the Upper Peninsula. The protein content of this hay was not as high as the average for good alfalfa hay, but timothy hay from a plat treated with 8–16–8 fertilizer slightly exceeded in protein content alsike clover hay from plats receiving 0–16–0 and 0–16–8 mixtures. Fertilizer high in nitrogen increased the protein content of the hay appreciably and increased greatly the total quantity of protein in the hay per acre. Timothy hay from the highest yielding fertilized plats was better in quality than hay from unfertilized plats when harvested from June 25 to July 6.

Tobacco Substation at Windsor, report for 1935, P. J. Anderson, T. R. Swanback, and O. E. Street (*Connecticut* [*New Haven*] *Sta. Bul. 386 (1936), pp. 541–608, figs. 13*).—Reports are made on several agronomic experiments with cigar leaf tobacco (E. S. R, 73, p. 175) and also on articles noted on pages 206 and 214 in this issue.

Fertilizer experiments with single sources of nitrogen (pp. 546–552).—Results obtained, 1930–35, with cottonseed meal, castor pomace, linseed meal, ground fish, corn gluten meal, soybean oil meal, sodium nitrate, ammonium sulfate, urea, and calnitro did not reveal great differences in yield and grade indexes among the different organic materials. Price may be a factor in the choice of materials in a given season. A certain percentage of urea and calnitro might also be used to advantage in the fertilizer mixture. Ammonium sulfate is not recommended. If used at all, only a small percentage of sodium nitrate (and other nitrates) should be included in the original mixture for broadcasting, but some should be reserved for side dressing immediately after leaching rains. Soybean oil meal is promising but has not been tested enough to warrant recommendation at present.

Nitrate nitrogen and soil acidity production by nitrogenous fertilizers, O. E. Street (pp. 552–574).—The soil nitrates and soil reactions on plats treated with different nitrogen carriers were measured, 1932–35. The data indicated that soil nitrate levels vary widely due to the interaction of factors favoring accumulation of nitrates, such as high temperatures and adequate moisture, with the factors favoring their removal, such as heavy rains and rapid plant growth. The relative availability of organic materials in relation to plant needs indicated that all those tested are about equally valuable. The rapidity of decomposition was in the increasing order of cottonseed meal, corn gluten meal, castor pomace, linseed meal, and dry ground fish. Inorganic materials range from immediately to slowly available. Nitrates are subject to too ready leaching, while ammonium sulfate produces abundant nitrates but is objectionable because of its acid character. Urea is deemed a very good source of nitrogen.

Moderate rains of not more than 1 in. per week, it appeared, greatly stimulate nitrification, whereas heavy or persistent rains of 2 in. or more in a short period cause a heavy loss of soil nitrates. Speed of recovery after rains varies with the class of material, being slowest after vegetable organics which are followed by animal organics and urea.

Soil reactions determined concurrently indicated the acidic character of all materials used except sodium nitrate. Seasonal fluctuations average 0.67 pH unit for organic materials, 0.85 for inorganic, and 0.43 pH unit for no nitrogen.

Further fertilizer experiments with cottonhull ashes (pp. 574–578).—This series of tests, 1932–35, supplementing earlier work (E. S. R., 67, p. 381), has shown that the use of a formula comprising cotton-hull ashes and cottonseed meal has produced very excellent tobacco, which at least equals that grown with a similar formula containing other potash carriers. The use of cotton-hull ashes has not resulted in any greater accumulation of potassium, calcium, magnesium, phosphorus, or nitrogen salts in the soil in 4 yr. and has had no influence on fire-holding capacity, nor were consistent differences observed in color or coherence of the ash, width of coal band, or in the taste and aroma of the cigars. The slight increase in soil reaction was not injurious here and would not be dangerous except on soils with a naturally high reaction. Analyses indicated that the basic content of tobacco was not significantly changed by the use of cotton-hull ash.

Further investigations on the use of fertilizer magnesia (pp. 578–585).—Additional (E. S. R., 69, p. 518) magnesium studies are reported on. The quantity of magnesia in the fertilizer did not greatly affect the yield of grading of the crop but decidedly influenced combustion. The color of ash of a cigar is an index of its chemical composition. A relative excess of potassium may produce a dark ash, while increasing amounts of magnesium will brighten the ash proportionately. Excess of manganese in the ash was found to give it an undesirable color known to the tobacco trade as "muddy" or "brick color", but the discoloration does not appear at a minimum of less than 0.04 of 1 percent manganese (Mn_3O_4) in the leaf.

For proper combustion of the leaf, an annual application of from 75 to 100 lb. of magnesia as magnesian lime was found preferable to larger applications at intervals of several years. Chemical analyses revealed the presence of about 2 percent MgO in the leaf at the above rate of application. Smoke tests have corroborated these findings.

An attempt to determine needs for magnesia by microchemical soil tests (E. S. R., 67, p. 105), gave results which, while not conclusive, indicated the possibilities of the method.

Tests of an anhydrous magnesium sulfate (about 30 percent MgO), a nearly neutral salt, showed it to be from 10 to 14 percent more efficient than magnesian lime. It may be used for tobacco on soils having a desirable reaction and satisfactory calcium content but in need of considerable magnesia.

Experiments to determine the best time to harvest Havana seed tobacco (pp. 585–587).—Respective lots of plants were harvested 1, 2, and 3 weeks after topping on July 22. Plants harvested 1 week after topping cured very slowly and green leaves remained long after the others had cured, and their leaves were thinner, somewhat shorter, and all grades had an olive-green cast, but appeared silky and of excellent quality otherwise. The plants harvested last cured soonest. The leaves from the later harvestings were distinctly heavier, coarser with more prominent veins, longer, and the green cast was gone; there was a higher proportion of starved yellow leaves, attributable to shortage of soil nitrates due to excessive rains in June and July and classed as "brokes", especially among those harvested 3 weeks after topping. There was a steady increase in weight of leaf after topping up to at least 3 weeks. The actual leaf area increased continuously after topping. There was no actual increase or accumulation of salts as expressed in percentage of the dry weight of the leaves.

Effect of shade cloth on atmospheric conditions (pp. 607, 608).—In repeated observations (E. S. R., 73, p. 176) reductions of light intensity under shade tents ranged from 30 to 63 percent, and under trees from 83 to 95 percent of intensities in the open. Temperatures were lower under the tent in three determinations and equal in two. Relative humidities were from 11 to 23 percent higher in all but one case, a foggy morning.

A preliminary study on the burning quality of cigars prepared with native and imported wrappers, S. B. Oliveros, C. G. Ramos, and D. B. Paguirigan (*Philippine Jour. Agr., 6 (1935), No. 4, pp. 479–495, fig. 1*).—Fourteen brands of cigars made with uniform filler and binder but wrapped with Viscaya grown in La Union and in Isabela, Havanensis grown in Georgia and in Puerto Rico, and with Sumatra-grown Sumatra wrappers, totaling 700 cigars, were smoked mechanically, and data were secured on evenness of burn, firmness of ash, coaling, and length consumed, and observations made on other characteristics. Few significant differences were noted between any two differently wrapped cigars. Sumatra-wrapped cigars ranked highest and had the whitest ash, being followed in order by cigars wrapped in Isabela, Georgia, Puerto Rico, and La Union wrappers.

HORTICULTURE

A new "weed" fungus in mushroom beds [trans. title], F. Passecker (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 6, pp. 271–277, fig. 1*).—*Pleurotus passeckerianus* is reported as a weed in beds of the cultivated *Agaricus*, nonparasitic in nature but appropriating the food supply of the mushroom and inhibiting the spread of its mycelium. The fungus was isolated in pure culture and its growth relations and life history were studied. Control measures are suggested.

New varieties of cannery peas, C. B. Sayre (*Farm. Res.* [*New York State Sta.*], *3 (1936), No. 1, pp. 6, 7, fig. 1*).—In this general account 15 recently introduced varieties of canning peas are compared with standard early and late varieties, both as to characteristics in the field and as to value for canning. Some of the new kinds were outstanding, among them being Wisconsin Early Sweet and Dark Podded Thomas Laxton, both early varieties, and Asgrow Pride, Asgrow Canner King, Rogers Climax, and Early Perfectah, all late varieties.

The effects of weather on fruit ripening, R. E. Loree (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 12–16*).—Stating that except for a few weeks in July and August unusually cool weather prevailed in Michigan in the 1935 growing season and that many varieties of fruits failed to ripen fully, the author analyzes the climatic situation during the summer months of the years 1931–35 and shows how closely satisfactory maturity is associated with temperature, length of the growing season, and other climatic factors. He suggests that the value of a variety cannot be judged by its performance in any one season.

Researches on falling of fruit [trans. title], G. Bernon (*Ann. École Natl. Agr. Montpellier, n. ser., 24 (1936), No. 1, pp. 57–68, figs. 5*).—It is concluded from this study that fruit drop in the Clairette variety of grape is associated with a pollen imperfection coupled with a nutritive deficiency in the fruit. Recourse to cross-pollination and to ringing, coupled with pinching back, assured normal fruiting.

The influence of various phases of Bellefontaine fine sandy loam and Washtenaw silt loam on the growth of apple trees, N. L. Partridge and J. O. Veatch (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 124–130, pl. 1, fig. 1; abs.

in Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 62, 63).—Using as plant material young nonbearing Sutton apple trees growing in an orchard located about 3 miles south of Galesburg, Mich., the authors found positive correlations between tree growth, as shown in average tree circumference and the height and diameter of the top, and certain soil properties, notably nitrogen content, water-holding capacity, and available phosphorus. It was not possible under the conditions of the investigation to determine the relative importance of the influencing factors.

An experiment in double working apple trees in the nursery, F. C. Bradford and L. Joley (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 360–365; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, p. 60*).—Using as plant material double-worked apple trees first budded in 1933 to Jonathan and again in 1934 to a Winesap sport, four treatments were compared as follows: (1) All laterals removed from the intermediate Jonathan stem, (2) three shoots averaging five leaves each left on the lower half of the intermediate piece, (3) three shoots left on the upper half, and (4) three shoots left on the lower and three on the upper portion. Measurements of the top scion showed the consistently largest diameter and longest shoots in group 1 and the lowest in group 4. Foliage on the upper half of the intermediate piece had a more depressing influence on the scion than did that left on the lower half. Diameter increment of the intermediate section just below the second budding point was greatest in trees which developed the largest top scions and least in those producing the smallest tops. Diameter increase of the intermediate stem just above the first bud point was apparently depressed by the absence of foliage on the lower half of the intermediate section. From a practical standpoint the best trees for orchard planting were those produced with no foliage on the intermediate stem.

The relation of washing treatments to subsequent losses in moisture from apples, R. E. Marshall, F. L. Overley, and K. Groves (*Washington Sta. Bul. 330 (1936), pp. 28, figs. 9*).—Using for the most part apples harvested from experimental spray plats near Wenatchee and stored at a temperature of from 32° to 34° F. and at a relative humidity of 80 to 85 percent, the authors found that, although all the washing treatments employed resulted in some subsequent acceleration of moisture loss rates, apples may be held in well constructed and well managed cold storage plants during the usual storage season without appreciable loss of moisture, irrespective of the washing treatments. Increased loss of water from apples washed in hydrochloric acid, sodium silicate, soda ash, or aluminum chloride solutions at temperatures not in excess of 110° were not of serious proportions. The addition of mineral oil to the washing solution caused some acceleration in subsequent rate of moisture loss, and the most severe washing treatment with respect to moisture loss was that of tandem acid and silicate solutions, both fortified with mineral oil and heated to 120°. Although certain small but consistent differences were observed in rates of water loss from apples from the different spraying plats, the differences were not significant enough to concern the grower.

Transportation of apples from the Shenandoah-Cumberland section to overseas markets, P. L. Harding and C. L. Powell (*U. S. Dept. Agr., Tech. Bul. 523 (1936), pp. 27, figs. 7*).—In these studies, which included the following of apple shipments from the Shenandoah Cumberland region to Jersey City and in a few cases all the way through to English ports, it was observed that cooling the fruit by refrigeration in the car and in the ship had a highly beneficial effect on its condition when arriving at destination. Where apples were refrigerated in both the car and in the ship's hold the fruit arrived in England

practically free from decay and in good condition, whereas fruit shipped without refrigeration was usually fully ripe upon arrival, with varying amounts of decay and sometimes with internal break-down as well. Barreled apples shipped without refrigeration, particularly without cooling in the vessel, arrived nearly always in a slack condition, and the improved selling value of summer and early fall apples shipped under refrigeration was sufficient to indicate that refrigeration is profitable.

Observations during rail transit to Jersey City indicated that under ordinary conditions refrigeration as compared with ventilation reduces the fruit temperature approximately 10° in the top layer and 25° in the bottom layer barrels during the 40-hr. transit period. In one test, icing before loading gave lower temperatures than when the initial icing followed loading. The duration of the transfer period from car to ship was a problem, since the fruit warmed rapidly in the interim, and from 48 to 84 hr. of refrigeration aboard the ship were required to again reduce the temperature. Fruit transfer from refrigerated cars to nonrefrigerated ships lost its low temperature entirely within 2 or 3 days.

Comparisons of high-calcium and dolomitic hydrated limes in bordeaux, zinc-lime, and iron-lime on cherry and peach, W. C. Dutton and L. R. Farish (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 186–190; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 60, 61*).—Comparisons of high-calcium and dolomitic hydrated limes for the preparation of bordeaux sprays for Montmorency cherries and in zinc-lime and iron-lime mixtures as arsenical correctives for peaches showed that the dolomitic lime is equal to or possibly better than high-calcium lime in the manufacture of bordeaux for cherry spraying, and that for correcting arsenical injury to the peach high-calcium lime is better apparently in the iron-lime combination and dolomitic lime in the zinc-lime mixture. Bordeaux mixture, whether made from dolomitic or high-calcium limes, accentuated the effect of droughts. Premature leaf fall in the Montmorency cherry, caused undoubtedly by copper injury, was much more severe in midsummer with the high-calcium lime bordeaux than with the dolomitic lime bordeaux.

Propagating low- and highbush blueberry plants by means of small side shoots, S. Johnston (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 372–375, figs. 2; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, p. 60*).—Newly formed straight, heel, and mallet side shoot cuttings of lowbush blueberries were set in granulated German peat moss, Sorbex, and a 50:50 mixture of German peat and acid sand. Good results were secured in all cases, with the highest average rooting percentage (81.7) secured with the heel cuttings. The mallet type gave the poorest results, with an average of 61.7 percent for the three mediums. The use of short laterals taken in early June thus permitted a more rapid increase than was possible with dormant hardwood cuttings where only a limited amount of material was available. In trials with varieties of highbush blueberry, such as Adams and Rubel, straight cuttings of the laterals gave better results than did heel or mallet cuttings.

Three new raspberries share the limelight, G. L. Slate (*Farm Res. [New York State Sta.], 2 (1936), No. 1, pp. 11, 13*).—Descriptive accounts are given of three new raspberries developed at the station, namely, Marcy, said to be the largest red raspberry growing at Geneva, Indian Summer, a new fall-bearing variety, and Sodus, a promising new purple raspberry.

New purple raspberry should be isolated, L. M. Cooley (*Farm Res. [New York State Sta.], 2 (1936), No. 1, p. 3, figs. 3*).—In this popular account the author points out that the Sodus variety is rapidly gaining favor but is sus-

ceptible to mosaic infection from established plantings of the Columbian variety, all plants of which are said to carry infection. As a practical suggestion the author advises that Sodus plants should be grown as far as possible from the Columbian, a distance of 50 to 60 rods being highly desirable.

The physiology and control of pecan nut filling and maturity, A. H. Finch and C. W. Van Horn (*Arizona Sta. Tech. Bul. 62 (1936), pp. 421–472, figs. 14*).—Stating that the failure of nuts to fill properly is a recognized and puzzling problem in pecan-producing areas of the southern United States, the authors present the results of studies with trees of the Burkett variety growing under different soil and cultural conditions. It was observed earlier (E. S. R., 75, p. 491), that, whereas a relatively high degree of vegetativeness was required for abundant blossoming, a relatively low degree of vegetativeness favored nut filling and maturity. Where moisture and nitrates, particularly, and phosphates to a less degree were maintained at high levels, a relatively high degree of vegetativeness resulted, and conversely where soil moisture and nitrates were maintained at a relatively low level, medium to low vegetativeness was obtained.

The authors followed the various stages of filling and observed the first evidence of filling in the formation of a thin layer of gel on the inner wall of the seed coat. From 5 to 7 days later a conversion of the gel into a layer of white solid material was noted, and by chemical tests it was found that this change accompanied a conversion of sugars to fats. In nuts well filled at harvest the process of filling proceeded rapidly, whereas in poorly filled nuts the process proceeded at such a slow rate that filling was never completed. Practices or conditions which tended to reduce vegetativeness tended to increase the storage of carbohydrates during the summer, filling being apparently dependent upon (1) carbohydrates stored in the shoots or elsewhere in early summer, and (2) carbohydrates moving directly from the leaves to the nuts. The storage of starch in fruit-bearing shoots was initiated in early summer and reached a maximum shortly before nut filling began. During nut filling starch diminished in the fruiting shoots but not in the vegetative nonfruiting shoots, where a maximum was reached in early autumn. The best-filled and the highest oil-containing nuts were borne by trees the shoots of which attained a high content of starch during the period preceding filling. The percentage of oil in the kernels was found to vary inversely to the vegetativeness of the tree. Expressed on a percentage basis, the nitrogen content of the kernel indicated an inverse trend to that of oil. The phosphorus content of the kernel expressed either as percentage or as total amount per nut apparently bore no consistent relationship to vegetativeness of the tree or to oil content or filling. The practical applications of the study to commercial usage are discussed.

Preheating gladiolus corms, A. Laurie and G. R. Mann (*Ohio Sta. Bimo. Bul. 182 (1936), p. 117*).—Altair, Angola, and Alice Tiplady corms dug September 10, stored in a potato storage, and then held in an incubator at 85°F. for a period of several weeks prior to forcing in the greenhouse came into blossom approximately 1 mo. earlier than comparable corms that were not subjected to the preheating treatments. The production, number of flowers per spike, and length of stems were not significantly different in any of the treatments. One mo. of preheating was apparently as beneficial as more time in stimulating early blossoming.

Flower seeds come under seed law, M. T. Munn (*Farm Res. [New York State Sta.], 3 (1936), No. 1, pp. 8, 12*).—This is a brief summation of information previously published (E. S. R., 75, p. 205).

FORESTRY

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul. 407 (1936), pp. 28, 29*).—Brief progress statements are presented on studies dealing with the value of different wave lengths of light in the synthesis of carbohydrates in various softwoods, the thinning of young Scotch and white pines, the effect of soil temperature on growth of forest seedlings, and the factors affecting natural reproduction in the forest.

Application of the Koch profile method in the construction of visibility maps, C. MESAVAGE (*Jour. Forestry, 34 (1936), No. 9, pp. 870–872, figs. 2*).—This contribution from Pennsylvania State College suggests the technic for applying the Koch profile method in the construction of visibility maps.

The influence of range plant cover on the rate of absorption of surface water by soils, C. K. PEARSE and S. B. WOOLLEY (*Jour. Forestry, 34 (1936), No. 9, pp. 844–847, fig. 1*).—Measurements by the Intermountain Forest and Range Experiment Station on the absorption rates of surface water on carefully paired and comparable bare and vegetated plats showed a close relationship between the rate of absorption of water by the soil and the presence and character of the plant cover. Soil differences were not a factor, as analyses showed the soils of the paired plats to be almost identical. Fibrous-rooted species were about 2.5 times as effective in increasing absorption as were taprooted plants. The numerous fine roots of fibrous-rooted plants provided numerous channels for facilitating the entrance of the water into the soil. Since almost all the palatable forage plants of the region are fibrous rooted, the authors suggest that water conservation and proper range management may well go hand in hand.

Lethal high temperatures for conifers and the cooling effect of transpiration, H. L. SHIRLEY (*Jour. Agr. Res. [U. S.], 53 (1936), No. 4, pp. 239–258, fig. 1*).—One to 4-year-old plants of red, white, and jack pines and white spruce were exposed to accurately controlled high temperatures in a water bath, in moist air, and in dry air. Resistance to excessive heat was found to increase with the increasing age of the plant and the increasing size or mass of the plant or tissue. The tops of plants were more resistant than the roots. Only slight injury was caused by submerging tops of plants for 5 hr. in water at 44.3° C. (111.7° F.), but at 49° needles were killed with only 2 hours' exposure. The maximum temperature which needles of similar plants withstood for 5 hours' exposure in moist air (relative humidity 85 percent) was 50° and in dry air (relative humidity 15 percent) 54°. The higher death point in dry air is attributed to the cooling effect of transpiration. Differences among species in their ability to withstand high temperatures were slight. Recovery from severe heat injury was associated with epicormic sprouting from the massive portion of the stem. White pine and white spruce excelled over the other two species in this respect.

Effect of increment boring on Douglas fir, W. H. MEYER and S. B. HAYWARD (*Jour. Forestry, 34 (1936), No. 9, pp. 867–869, fig .1*).—Each of 30 second-growth Douglas fir trees growing on the Wind River Experimental Forest, Wash., ranging in diameter from 6 to 20 in. and comprising dominant, codominant, intermediate, and suppressed individuals, was bored at breast height on all four sides. One hole was plugged with a maple dowel, one with a twig, one with the extracted core, and the fourth was left open. Observations 5 yr. later on felled trees showed (1) staining of the wood around the hole by free resin, (2) extension of the heartwood periphery, (3) acceleration of growth in the immediate vicinity of the hole, and (4) usually the formation of callus over the unplugged holes. There was no value in closing the holes, as hardened

pitch soon sealed the openings. The damage from increment borings is said to have little effect on the life of the trees or on their subsequent lumber value.

A thinning experiment applied to timber stand improvement, G. A. Pearson (*Jour. Forestry, 34 (1936), No. 9, pp. 855–861, figs. 2*).—Remeasurements made in 1935 on sample thinning plats established in 1925 in a second-growth stand of ponderosa pine near Prescott, Ariz., showed that the thinning plats although lower in basal area after the original thinning had made the greatest increment. The larger trees in the thinning plats were found to be gaining in diameter as rapidly as the smaller trees. The unthinned plats appeared to have stagnated. In 1930 a second control plat was established on an apparently better quality site, but in 1935 the lowest increment was recorded on this plat despite the fact that it had the greatest initial basal area. The author points out that the rather low precipitation in northern Arizona may well have been the limiting factor. Measurements on trees selected because of their thrifty dominant growth showed them to be making a slightly higher rate of diameter growth than the general run of trees of the same classes. The crop trees on the thinned plats made uniformly greater growth increment than did comparable trees on the unthinned plats. A type of thinning which embraces selected crop trees rather than the whole stand is conceded desirable in regions where low precipitation limits drastically the number of trees per acre.

Some results of thinning in small pole stands of ponderosa pine in the Southwest, E. M. Hornibrook (*Jour. Forestry, 34 (1936), No. 9, pp. 862–866*).—Studies in thinning plats established in 1926 in north-central Arizona by the Fort Valley Experiment Station in a 41-year-old natural stand of ponderosa pine showed that the mean diameter at breast height increment of crop trees on widely spaced plats was significantly greater than that of trees on plats of closer spacing and even more significantly greater than the mean increment of crop trees on the control plats. The mean difference between diameter increments of the narrow-spaced trees and the controls was not significant. The mean basal area increments of selected crop trees for the thinned wide-spaced plats were significantly greater than for either the narrow spacing or the controls. The differences in mean height increment for all three treatments were insignificant.

Early survival of some pine interplantings in southern New Jersey, O. M. Wood (*Jour. Forestry, 34 (1936), No. 9, pp. 873–878, fig. 1*).—Individual histories of several thousand pines interplanted during the years 1930 to 1933 on cut-over hardwood land showed heavy losses from various causes, such as drought, animals, and insects. Although about 60 percent were alive in 1934, only 36 percent were vigorous. Liberation cuttings will be needed to keep the planted pines growing vigorously in the future. Although the losses had been extremely severe, the author points out that the proportion of softwood seedlings in the stands had been substantially increased and that some of the planted species are superior to the native pines.

Effect of fire in preparation of seedbed for longleaf pine seedlings, H. H. Chapman (*Jour. Forestry, 34 (1936), No. 9, pp. 852–854*).—Observations on permanent plats of 1/100 acre established at Urania, La., demonstrated the following facts: (1) Bare plowed soil is the most favorable germinating bed for longleaf pine, (2) the replacement following heavy grazing of broomsedge by carpet grass favors seedlings, (3) hardwood leaf litter is very favorable to the germination of longleaf pine, (4) pine straw is unfavorable, and (5) broomsedge unburned long enough to form a mat of dead grass totally excludes seedlings. Seedling exclusion is said to be purely mechanical in the presence of

an impervious blanket of dead vegetation. Properly timed and properly managed winter fires killed back the competing vegetation, checked brown spot disease, and prevented disastrous summer fires.

Germination and survival of longleaf pine, E. G. Roberts (*Jour. Forestry, 34 (1936), No. 9, pp. 884, 885*).—Sowings of longleaf pine made by Louisiana State University on unburned and burned over land near Bogalusa showed no germination whatsoever on either type of soil unless the beds were protected from birds and rodents. On the protected beds the germination and survival were higher on the burned areas. Most of the losses on the burned plats, that is, of seedlings germinating in December, occurred in January.

Seedling-sprout growth of shortleaf and pitch pine in New Jersey, E. B. Moore (*Jour. Forestry, 34 (1936), No. 9, pp. 879–882*).—Observations on an area in Burlington County, N. J., which was planted to shortleaf pine seedlings in 1928 but was burned over in May 1930 when the trees were about 2 ft. high, showed in December 1930 dense clusters of sprouts developing from the root collars of the burned seedlings. Some sprouts were 18 in. tall. A count showed 478 pines per acre, of which 65 percent were shortleaf and 35 percent pitch pine from natural reproduction. The pitch pine was somewhat superior to the shortleaf. In the summer of 1932 the plat was partially cleared of hardwood sprouts. Records taken in the winter of 1935–36 showed a loss of only 8 percent of the pines during the 5 yr. Pitch pine maintained its supremacy, but on the whole both species were making a good showing.

Canadian woods: Their properties and uses, T. A. McElhanney et al. (*Ottawa: Canada Dept. Int., For. Serv., 1935, pp. XV+345, figs. [133]*).—This book contains data with respect to the properties and uses of Canadian woods required by those directly engaged in the wood-using industries.

DISEASES OF PLANTS

The Plant Disease Reporter, September 15 and October 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 16, pp. 247–270, figs. 4; 17, pp. 271–282, fig. 1*).—Among other items of current interest, these issues contain the following notes:

No. 16.—Bacterial wilt of corn in 1936 (reports by various individuals from Massachusetts, Connecticut, New York, Pennsylvania, western Maryland, Virginia, Ohio, Michigan, Indiana, and Kentucky, concluding with a general summary); watermelon diseases in Water Valley, Miss. (with anthracnose reaching an epiphytotic stage), by P. R. Miller; a nonparasitic trouble of watermelon in Georgia (apparently related to the water supply), by M. B. Hardy; vegetable diseases in Ohio (particularly bacterial canker and buckeye rot of tomato), by J. D. Wilson; tomatoes resistant to *Cladosporium fulvum* leaf mold, by E. F. Guba; bacterial canker of tomato prevalent in Maryland, by H. A. Hunter; the pea mosaic situation in New York State in 1936, by A. L. Harrison; the occurrence of peach scab in Oregon, by S. M. Zeller; the raspberry disease situation in the Hudson Valley, N. Y., by L. M. Cooley; the first report of *Verticillium* wilt of strawberries from Oregon, by S. M. Zeller and L. E. Weaver; a hop disease survey in New York State in 1936, by R. O. Magie; miscellaneous notes on plant diseases in Mississippi, by P. R. Miller; and status of the Dutch elm disease, by R. P. White.

No. 17.—Observations on cotton diseases in the Mississippi Delta, by P. R. Miller; will heat and dry weather kill *Venturia inaequalis?* by H. W. Anderson; further observations on silver leaf of fruit trees in New York, by E. M. Hildebrand; boxwood (*Buxus*) diseases in Virginia, by J. G. Harrar and S. A.

Wingard; *Cercospora calendulae* leaf spot of *Calendula* in Virginia and powdery mildews (*Erysiphe* spp.) collected in Virginia, both by J. G. Harrar; and notes on the condition of *Zostera marina* in Buttermilk Bay, Mass. (with special reference to spread and to disease), by N. E. Stevens.

The mechanism of immunity in plants [trans. title], M. ABATA (*Bol. Ist. Sieroterap. Milan., 14 (1935), Nos. 6, pp. 558–577; 7, pp. 682–698, pls. 6; Ger. abs., pp. 692, 693*).—By means of root absorption bean plants were "vaccinated" with various mycelial extracts of *Botrytis cinerea*. A portion received no further treatment, some were wounded under sterile conditions, others were inoculated with this fungus through wounds, and the behavior of the three lots and of nonvaccinated controls was compared. The methods and technic are detailed. The vaccinated plants succumbed much less frequently than the controls. Material of the three lots—fixed, sectioned, and stained—was compared microscopically as to the nature of the defensive barrier developed around the infection focus, of the cell wall thickenings and contents, and of the intracellular precipitates, as well as to the appearance of the specific cell "organs" (vacuoles, nuclei, plastids, and chondriosomes) and the general host-parasite relations.

The results led to the belief that the defense reactions are only in part of traumatic nature. A form of congenital immunity appeared to exist in the nonvaccinated plants, but in the vaccinated plants the defense reactions were much more rapid and intense, leading to a condition of "hypersensitivity." The scanty growth of the fungus and other reactions in the vaccinated plants suggested that the basis of the resistance lay not solely in any acquired immunity but that it was conditioned by histocytological factors. The hypothesis of microbicidal substances secreted by the cells of the defense barrier under the stimulus of infection is advanced, and it is believed that the condition here concerned is an "immunity through hypersensitivity", a type well known in animals for both the acquired and congenital forms.

The position of the immunity problem in the virus diseases of plants [trans. title], J. G. O. BOTJES (*Tijdschr. Plantenziekten, 42 (1936), No. 1, pp. 1–9*).—This is a review of the more recent findings, with a bibliography of 11 titles.

Recent work on the plant viruses, K. M. SMITH (*Cur. Sci. [India], 4 (1936), No. 8, pp. 565–569*).—This is a general review.

The virus diseases of glasshouse and garden plants, K. M. SMITH (*Sci. Hort. [Wye, Kent, Eng.], 4 (1936), pp. 126–140, figs. 8*).—This is a general account of the tomato spotted wilt virus, cucumber mosaic virus 1, cabbage mosaic virus, the virus mosaic or stripe disease of bulbous plants, virus diseases of lilies, and virus disease of zonal pelargonium. Discussions of the various hosts and of control measures are included.

Virus diseases of East African plants, IV–VI, H. H. STOREY (*East African Agr. Jour., 1 (1936), Nos. 4, pp. 333–337, figs. 9; 6, pp. 471–475, figs. 4; 2 (1936), No. 1, pp. 34–39, figs. 6*).—Continuing this series (E. S. R., 74, p. 792), the author discusses in part 4, A Survey of the Viruses Attacking the Gramineae, the common sugarcane mosaic group, "Agaul" mosaic, the streak group, "R. P. 8" streak, stripe disease, and a new mosaiclike disease of maize shown to be due to a virus transmitted by a species of *Cicadulina*; in part 5, Streak Disease of Maize, the distribution of maize streak in Africa, the effects on the plant, transmission by insects, the host range, recognition of the disease, and control; and in part 6, A Progress Report on Studies of the Disease of Cassava, the mosaic groups, the brown streak virus (recently recognized), and control measures for the virus diseases of cassava.

Preliminary notes on the virus diseases of some economic plants in Kwangtung Province, W. T. H. Ho and L. Y. Li (*Lingnan Sci. Jour., 15 (1936), No. 1, pp. 67–78, figs. 12; Chin. abs., p. 78*).—This paper is stated to present a collection of data obtained mostly by field observations during the preceding few months on virus diseases of peppers (*Capsicum* spp.), papaya (*Carica papaya*), rattlebox (*Crotalaria saltiana*), cucumber, fig (*Ficus carica*), tomato, mulberry (*Morus alba*), tobacco, bean (*Phaseolus vulgaris*), eggplant, potato, sugarcane, and sweet corn.

A survey concerning a native pathogen, Armillaria mellea, J. L. Hewitt (*Calif. Dept. Agr. Bul., 25 (1936), No. 2, pp. 226–234, figs. 5*).—This reports the results of a survey of some 80,000 acres of citrus, walnut, and other groves in Orange County containing local infection areas of *A. mellea* during the winter of 1933–34 and backed by 5 yr. of observation. The data presented concern the wild and cultivated hosts and their susceptibility, the distribution of the disease, nursery infections, and recommended control measures.

Chemical composition of Bacterium tumefaciens, E. Chargaff and M. Levine (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 5, pp. 675–677*).—This is a preliminary report on analyses of the acetone-soluble fat, polysaccharide, and phosphatide of this organism, and of initial tests on Paris daisy, geranium, and *Ricinus* as apparently indicating that the phosphatide acts as a growth stimulant, whereas the fat is much less active.

The behavior of different forms of Solanum demissum to four different *lines* of Phytophthora infestans [*trans. title*], R. Schick *and* P. Schaper (*Züchter, 8 (1936), Nos. 3, pp. 65–70; 4, pp. 102–104*).—The results of inoculations of various forms of *S. demissum* with *P. infestans* (here tabulated and discussed) indicated that besides those which are completely resistant there are also forms completely susceptible, and still others which are resistant to some races of the fungus but not to others. Besides the forms homozygous for resistance, there are numerous others which show cleavages in their behavior toward various lines of *P. infestans*. Therefore, any *S. demissum* material to be used in the breeding of *Phytophthora*-resistant cultivated potatoes must first be tested against different lines of the fungus, and it is possible to isolate homozygous strains which are suitable for a test collection. By crossing within the species it is also possible to study the genetics of *Phytophthora* resistance without the cytologically conditioned disturbances present in species crosses.

The relations of *S. antipoviohii*, *S. ajuscoense*, and *S. verrucosum* to *P. infestans* appeared to be similar, although there were at hand no forms of these species resistant to all known lines of the fungus.

Mode of penetration and of progressive invasion of fire-blight bacteria *into apple and pear blossoms*, H. R. Rosen (*Arkansas Sta. Bul. 331 (1936), pp. 68, figs. 77*).—As a result of this study, the following conclusions are drawn:

The nectarial region of pear blossoms (unlike apple) resides in an open, shallow, fully exposed, saucer-shaped tissue, and the nectar droplets are excreted through stomalike structures ("nectarthodes"), which often occur at the base of deep depressions. The flow of nectar appears to be regulated in the same manner as that of air or water vapor through stomata. The only openings free from cuticular covering—as avenues of bacterial invasion of nectarial tissue—are the nectarthodes. Beneath the epidermal cells lining the nectarial region is a zone of tissue probably functioning in the formation of nectar. This is a very receptive region for the growth of *Erwinia amylovora* (=*Bacillus amylovorus*). Within from 24 to 48 hr. after inoculation of nectar-secreting pear blossoms, the bacteria may be found in great numbers in localized areas on the nectarial tissue, their surface growth corresponding, in gen-

eral, to the areas occupied by the nectar droplets. Bacterial extensions were traced through the guard-cell openings and into the chambers below the nectarthodes. Their entrance is considered to be in the nature of a saprophytic growth through a natural opening, but their progressive invasion was accompanied by discoloration, plasmolysis, coagulation, and disintegration of the protoplasts in the immediate vicinity of the chamber. Aside from the passage through intercellular spaces, tissue invasion also involved localized dissolution of middle lamellae and delicate cell walls and even invasion of protoplasts, the latter being seen in infections not over 48 hr. old.

The nectarial tissues of normal apple blossoms revealed essentially the same structures. When fully opened apple blossoms were sprayed with pure cultures, penetration occurred more frequently on stigmas, anthers, outer receptacle walls, and calyx lobes than on nectarial tissues. The mode of invasion of nectarial tissues was essentially the same as in pears. The stigmas were especially receptive to invasion, and within the stigmatic and stylar tissues progressive penetration was chiefly via the intercellular spaces, with localized dissolution of middle lamellae and wedging of bacterial strands between the cell walls. Open apple anthers also served as excellent avenues of invasion. After passage down the lengths of the filaments, the bacteria were observed in the receptacle.

The data indicate that if blossom blight of pears is to be controlled by germicidal sprays, it is essential that the nectarial disks be covered. In apple blossoms, a protective covering, particularly on stigmas and anthers rather than on nectarial surfaces, is especially indicated.

Oversummering of fire-blight pathogen, spraying for control of fire blight, and abscission induced by Erwinia amylovora and Phytomonas syringae, H. R. Rosen (*Arkansas Sta. Bul. 330 (1936), pp. 60, figs. 15*).—There was a gradual reduction in the number of cases in which *E. amylovora* (=*Bacillus amylovorus*) was still viable in infected twigs and limbs as the summer advanced, and in September, of 165 blighted limbs and twigs studied, none yielded viable cultures. Blighted limbs and twigs of the pear and apple varieties commonly grown in Arkansas are thus not nearly so important as sources of inoculum for succeeding years as in regions of shorter growing seasons or as in certain Pacific pear-growing areas. No correlation was noted between the amount of fire blight on individual trees in one season with that of the succeeding season.

The results of spray tests for the control of fire blight (particularly blossom blight) in four successive years were compared, and the details are presented for three of these years. Trees sprayed with bordeaux mixture in the cluster-bud stage, calyx stage, and in the first cover spray (but not in the open-blossom stages) showed no better control than the lime-sulfur-sprayed controls. Trees sprayed with copper phosphate mixture, with and without two open-blossom sprays, showed such irregularity in control that no conclusions appeared warranted. In the 1935 tests the two open-blossom bordeaux sprays were responsible for the control of blossom blight and, indirectly, of that obtained for twig blight. In most of the years for which data were obtained, the amount of bordeaux russeting was negligible. In 1935 it was exceptionally severe, but was of no economic importance. For other apple-growing areas, particularly with strict grading, russeting to this extent would seriously reduce the value of the fruit. If fire blight is a serious problem, 1–3–50 bordeaux mixture, applied at least twice while the blossoms are wide open, should be given a thorough trial. Fruit setting appeared to be superior on trees sprayed with the weak mixture.

E. amylovora and *P. syringae* (=*Bacterium syringae*) were at times found in a high percentage of blossoms that had failed to set. It seems possible that the better set noted in the spray tests aimed primarily at control of blossom blight may have been due in part to control of abscission induced by these two pathogens. Even where there were no evidences of fire blight or blast, two open-blossom bordeaux sprayings would probably give a better set of fruit.

Copper sulfate, at the same strength as in 1-3-50 bordeaux mixture and incorporated in a vegetable medium otherwise promoting good bacterial growth, completely inhibited these two pathogens. Five mg of dried 1-3-50 bordeaux film was lethal to a population of about 10,000 bacteria in 10 min. Similarly, copper phosphate mixture was also lethal, but a dry film of copper oxide mixture of like weight was toxic to only 80 percent of such a population in 10 min. and was not completely lethal even in 30 min. With the bacterial population greatly increased and the amount of a dried film of copper phosphate mixture slightly reduced, the toxicity diminished within given time intervals. Comparisons between copper phosphate and copper oxide mixtures with and without lead arsenate indicated that the last named, applied with these sprays, possessed no toxicity for *E. amylovora*.

The toxicity of certain chemical agents to Erwinia amylovora, G. W. Keitt, J. A. Pinckard, L. Shaw, and A. J. Riker (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 4, pp. 307–317*).—The toxicity of each of 24 chemical compounds and several spray preparations to *E. amylovora* [=*Bacillus amylovorus*] was studied at the Wisconsin Experiment Station under rigidly controlled conditions. Of these materials, salts of silver and mercury proved most toxic. Lime-sulfur at 1–20 (twice the common summer spray strength) was nontoxic. Bordeaux and zinc sulfate-lime spray preparations were lethal at less than the concentrations commonly employed. For each material tested, details are presented with relation to its comparative toxicity and its possible practical application.

Fungicide No. 66, J. F. Adams and C. N. Priode (*Peninsula Hort. Soc.* [*Del.*] *Trans.*, *49* (*1935*), *pp. 40–45*).—In this investigation by the Delaware Experiment Station, a special study of the possible value of new detergents or their derivatives as fungicides was undertaken. The earlier work, done with sulfated lauryl alcohol, was followed by studies of several new types of detergents, one of which, an organic sodium sulfonate provisionally designated as Detergent No. 66, proved to be outstanding in performance of toxic efficiency as shown by laboratory tests with spores of *Macrosporium solani* and *Glomerella cingulata*. Further tests against various fungus diseases in greenhouse and field led to the conclusion that this new synthetic material has promising possibilities for use in fungicidal sprays. It has no conspicuous residue, is compatible with insecticides, and possesses some contact insecticidal properties.

A new copper fungicide, J. F. Adams and A. A. Nikitin (*Peninsula Hort. Soc.* [*Del.*] *Trans.*, *49* (*1935*), *pp. 73–80*).—The main objective in this study by the Delaware Experiment Station was to develop a new copper fungicide eliminating the hazards now connected with the use of bordeaux mixture and other standard copper fungicides in fruit spraying. Details of the chemical and technical studies will be presented later, but it is here stated that the new preparation is a synthetic copper zeolite—a very fine bluish powder containing about 25 percent of metallic copper, combined with ingredients rendering it nonhygroscopic and noncaustic. Thorough testing under field conditions for 8 yr. in comparison with other copper and sulfur preparations is believed to have established a basis for its wider use, both commercially and experimentally. Under average conditions, control of fungus diseases may thus be

attained with only half the amount of metallic copper generally used in bordeaux mixtures.

A method for the determination of the relative toxicity of insectofungicides to plants [trans. title], K. I. STRACHITSKIĬ (STRATSCHITZKY) and S. M. MASHTAKOV (MASCHTAKOW) (*Trudy Nauch. Inst. Udobr. i Insektofungisid.* (*Trans. Sci. Inst. Fert. and Insectofungicides* [*Moskva*]), *No. 123* (*1935*), *pp. 273–277, fig. 1; Ger. abs., p. 291*).—A method is described for the determination of the toxicity of preparations according to their action on germinating pea roots, and the results by this method are compared with estimations of the injuriousness from the "burned" areas induced. In this way a laboratory method of evaluation is worked out.

The incorporation of direct with protective insecticides and fungicides.—I, The laboratory evaluation of water-soluble wetting agents as constituents of combined washes, A. C. EVANS and H. MARTIN (*Jour. Pomol. and Hort. Sci.*, *13* (*1935*), *No. 4*, *pp. 261–292, pls. 2, figs. 4*).—For use in the study of various materials available as "spreaders" in combined sprays, a laboratory method is presented for the determination of spray retention. Materials of possible value as spreaders are classified on a structural basis, and analytical data of those selected for preliminary trials are recorded. Thus studied, the various physical properties examined (viz, spray retention, area of spread, contact angles, and surface tension) all arranged the materials tested in the rough, general order of activity, but except for these correlations the determination of any one characteristic proved insufficient for a general assessment of wetting and spreading properties. The results suggest that with materials of similar molecular structure it may be possible to generalize on the behavior as a spreader and wetter from a limited number of laboratory-determined properties.

Observations on some Fusarium diseases of cereals in France [trans. title], A. L. GUYOT (*Rev. Path. Vég. et Ent. Agr. France*, *21* (*1934*), *No. 4*, *pp. 143–186, pl. 1, figs. 10*).—Cereal crops in France frequently exhibit diseases, especially at the base of the stem, accompanied by the development of *Fusarium* species and often associated with take-all, the symptoms of which are here differentiated from the *Fusarium*-induced maladies. All the *Fusarium* forms encountered have been relegated either to *F. herbarum* (section *Roseum*) or to *F. culmorum* (section *Discolor*), and the morphological and cultural characters of the forms encountered were studied and are described in detail, together with the symptoms induced in the host.

Causes of the mass affection of oats with crown rust (Puccinia coronifera Kleb.), in 1933, in the region of Voronezh, M. V. GORLENKO (*Bot. Zhur. S. S. S. R.* (*Jour. Bot. U. R. S. S.*), *20* (*1935*), *No. 5*, *pp. 475–486, fig. 1; Eng. abs., p. 486*).—The mass infection reported is attributed to the abnormally abundant rainfall and the high humidity prevailing in 1933, and the direct source of infection to *Rhamnus cathartica*.

The two critical periods of infection for oats are said to be the time of dispersal of the aeciospores during late May and early June and the time of mass formation of the urediospores from late June through the first part of July.

Warm weather, with rains and fogs, from mid-March through April is said to insure a high germination of teliospores before the buckthorn leaves have opened, thus reducing the infection in this host. On the other hand, a cold winter followed by warm rains beginning at the close of April promotes teliospore germination at about the time the buckthorn leaves are opening.

The climatic relations for *Puccinia graminis* are believed to be similar.

Reaction of the Victoria oat variety to crown rust, H. C. MURPHY (*Phytopathology, 26 (1936), No. 4, pp. 396, 397*).—The original stock of Victoria (C. I. 2401), an oat variety highly resistant to crown rust (*Puccinia coronata avenae*), loose smut (*Ustilago avenae*), and covered smut (*U. levis*), contains some lines which, although morphologically similar, are susceptible to one or both of these diseases. It is suggested in this contribution by the Iowa Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry that oat breeders use for parental material only lines of Victoria known to be resistant to crown rust and smut.—(*Courtesy Biol. Abs.*)

Oat leaf infection by Ustilago avenae (Pers.) Jensen, B. B. MUNDKUR (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 745, 746, pl. 1*).—This is a report of *U. avenae*, rather rare in India, as infecting five oat varieties recommended by G. M. Reed as differentials for the determination of physiologic races of covered smut and obtained from him. On three of these varieties, not only the panicles but also the upper leaves were attacked.

The influence of seed hulling on loose smut in naturally inoculated oats, V. F. TAPKE (*Phytopathology, 26 (1936), No. 6, pp. 588–596*).—Seed of 10 lots of naturally inoculated oats was sown in the field and greenhouse at Rosslyn, Va., and 7 of these lots also in the field at Aberdeen, Idaho, the seed hulls being left attached to, or removed by hand from, the caryopsis.

The degree of reduction in smut resulting from removal of the hulls varied widely, both within individual lots grown under different conditions and between different lots grown under similar conditions. In one lot the percentage of reduction resulting from removal of the hulls varied from 2.1 to 90.2 in the three experimental locations, and in different lots grown under similar conditions wide variations in smut reduction from hulling also occurred. In general, relatively unfavorable conditions for smut were more acutely reflected in plants from hulled than from nonhulled seed. Evidently the removal of the hulls brings into play factors in addition to reduction in load of inoculum carried by the hulls. In oat smut studies, the common practice of applying dry spores to the surface of seed with or without the hulls does not involve protection of the inoculum by the hulls as in nature and introduces other unnatural factors. A study, under various conditions of seeding, of the comparability of results from different methods of seed inoculation with respect to the positional relation of inoculum and hulls would seem desirable.

The effect of several collections of Tilletia tritici and T. levis on the morphology of spring wheats, O. S. AAMODT, J. H. TORRIE, and K. TAKAHASHI (*Phytopathology, 26 (1936), No. 4, pp. 344–359, figs. 2*).—A comprehensive statistical study was made on the variation in morphology of six wheat varieties inoculated separately with four collections of *T. levis* and one of *T. tritici*.

Infection with either *Tilletia* sp. resulted in a reduction in the culm length, but no significant differences were obtained in the degree of stunting. The varieties responded somewhat differently in the degree of stunting induced by the several collections of bunt fungi. The stunting of inoculated, nonbunted plants indicated that nearly all plants become infected when inoculated. The infected spikes of the more susceptible varieties Reward, Little Club, and Kota showed considerably more spike elongation than the more resistant varieties Pentad, Hope, and Garnet. The shape and size of the bunt balls appeared to depend more on the wheat variety than on any inherent tendency of the fungus. The range in size of bunt balls for all collections was the same, but the averages for those of *T. tritici* were slightly smaller and rounder than for those of *T. levis*. No general association was fonnd between culm length, spike elongation, and bunt-ball shape.

Two years' field experiments in the bunt control (Tilletia tritici) of winter wheat Edel Epp by means of different seed treatments, conducted 1932–33 and 1933–34, K. Zaleski and J. Dobrywalski (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest Ann.), 35 (1935), No. 3, pp. 444–455; Eng. abs., pp. 454, 455*).—In these tests over two seasons, eight dust and six wet seed treatments were used, comprising some of the best classical methods in use in Germany, America, and Poland and including the new Polish "413 a" fungicide. All gave good results, and it is concluded that the one to be recommended is the one that can be used at the lowest cost locally.

Laboratory testing of seed disinfection.—I, Against wheat bunt [trans. title], F. Pichler (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 3, pp. 113–131*).—Citing 39 German publications dealing with fundamental phases of this problem, together with his own work, the author discusses his conceptions of research on chemical seed disinfection. Purely chemical studies of the preparation of disinfecting materials and careful study of their effects on seeds, seedlings, and disease organisms, especially under the complex influence of soil environment, are needed. Apparatus and methods are described in detail for the coordinated control and study of time of treatment, humidity, chemical concentrations, uniformity of seed, prestorage and afterstorage of seed, and culturing of treated seeds. Mathematical methods for calculating results are discussed and suggested formulas presented for separating the effects of different factors on seed germination and efficiency of disinfection.—(*Courtesy Biol. Abs.*)

Factor relations in wheat for resistance to Puccinia graminis tritici, Puccinia glumarum, and Erysiphe graminis, K. W. Neatby (*Phytopathology, 26 (1936), No. 4, pp. 360–374*).—"In the cross H–44–24×Marquis the seedling reaction to *P. glumarum* was found to be closely associated with the mature-plant reaction to *P. graminis*. In the group of lines with mature-plant resistance to *P. graminis* all lines susceptible to *E. graminis* were resistant or moderately resistant to *P. graminis* f. 36, and all lines susceptible or semiresistant to form 36 were resistant to *E. graminis*. In Marquillo×H–44–24 semiresistance to *P. glumarum* was found to be associated with the mature-plant resistance of H–44–24 to *P. graminis*. Resistance in the seedling stage to form 52 of *P. graminis* was associated with susceptibility to *P. glumarum*, and, likewise, susceptibility to form 52 was associated with resistance to *P. glumarum*. In Garnet×Double Cross the relationship between the seedling reactions to *P. graminis* f. 35 and *P. glumarum* was similar to that found in Marquillo×H–44–24 in regard to *P. graminis* f. 52 and *P. glumarum*. Susceptibility to *P. graminis* f. 21 was associated with red pigmentation of the straw.

"It is concluded that the relationships described are more probably due to a pleiotropic effect of the genes concerned than to genetic linkage." The significance of the results in regard to the nature of rust resistance is discussed briefly.

The breeding of spring wheat for resistance to loose smut and brown leaf rust [trans. title], A. P. Shekhurdin (*Selek. i Semen., No. 1 (1936), pp. 19–24*).—Records are given of hybridization work in U. S. S. R., beginning in 1929 and carried through 1935, relative to the development of wheat strains resistant to [*Ustilago tritici*] and [*Puccinia triticina*].

Fatigue of alfalfa soils: Causes and remedies [trans. title], A. Demolon and A. Dunez (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 15, pp. 579–588*).—Inoculation permitted alfalfa to succeed at points where this crop formerly succeeded but was abandoned because of repeated failures due to the disap-

pearance of the root-nodule bacteria from the soil. It is concluded that this disappearance, often attributed to soil acidity, was in reality of bacteriophagic origin coupled with the too long continued growing of this crop on the same soil. Inoculation, combined with a judicious selection of seed, retarded the appearance of fatigue and diminished considerably the time required between alfalfa crops. The less the soil has been contaminated by bacteriophage, the more quickly does it again offer favorable conditions for the functioning of the bacterial symbiosis.

New observations on bacteriophage and fatigue of soils in alfalfa [trans. title], A. Demolon and A. Dunez (*Ann. Agron.* [*Paris*], *n. ser., 6* (*1936*), *No. 3, pp. 434–454, figs. 3*).—The essentials of this article are given above.

The problem of acquired immunity in plants: Vaccination of beans against mold infection [trans. title], A. Kaliaew, A. Krawtschenko, and N. Smirnowa (*Zentbl. Bakt.* [*etc.*], *2. Abt., 92* (*1935*), *No. 8–12, pp. 209–220*).—The authors report that by the vaccination of different bean varieties with filtrates of bouillon cultures of *Botrytis cinerea* added to the soil or water culture in which the plants were growing a heightened resistance to subsequent infection as compared to the controls was obtained.

Potash and cotton wilt in central and north Mississippi, L. E. Miles (*Better Crops With Plant Food, 20* (*1936*), *No. 10, pp. 11–13, 40–44, figs. 4*).—Continuing previous work in southern Mississippi (E. S. R., 75, p. 644), tests (1928–31) are described as showing that the same effects are produced by potash on soils of various types in other parts of the State. For example, in one test, with an increase in potash from 0 to 8 percent, with the proportion of nitrogen and phosphorus remaining constant at 4 and 8 percent, respectively, the average wilt infection was reduced from 31.67 to 7.81 percent, and the average yield of seed cotton per acre was increased from 496.9 to 896.23 lb. Similar increases in the nitrogen content reduced the wilt infection only from 11.52 to 8.74 percent, with a yield increase of only 28.46 percent, while increases in the phosphorus content from 4 to 10 percent appeared to have relatively little influence on the amount of infection.

The results of these studies to date indicate that losses from wilt may be very materially reduced in the soils of southern, central, and northern Mississippi by the use of a suitably adapted variety of cotton possessing a relatively high resistance to wilt, together with a fertilizer containing an adequate amount of potash in a properly balanced formula. In most cases this will mean a material increase in the percentage of potash over that ordinarily used.

The significance of the fungus disease cotton wilt for Peru [trans. title], M. E. Odriozola (*Bol. Co. Admin. Guano* [*Lima, Peru*], *11* (*1935*), *No. 8, pp. 383–394*).—This is a general discussion of the disease and factors influencing its depredations in Peru, including the question of resistant varieties.

The effect of crazy top disorder on cotton plants and its control by irrigation management, C. Hope, C. J. King, and O. Parker (*U. S. Dept. Agr., Tech. Bul. 515* (*1936*), *pp. 44, figs. 22*).—This account gives the history of the disease, notes its occurrence in Pima cotton at the seed farm, Sacaton, Ariz., describes the symptoms, and gives the results of studies involving the physiology and morphology of the disease, the chemical composition of normal and diseased plants and plant parts, and the results of irrigation experiments.

Probably because of their higher sterility, crazy top plants attained greater height than normal ones, but the bracts and petals averaged smaller. A large proportion of the bolls reaching maturity on affected plants showed injurious effects of the disorder. Various forms of cross grafting and budding between normal and affected plants failed to transmit the disease. The chemical analyses

suggested that imperfect translocation of nutrients to the immature fruits of affected plants may influence the excessive shedding of squares and bolls and the poor development of the bolls that are retained. Apparently there was a tendency for the ash constituents and nitrogen to decrease with approaching maturity. Applications of various fertilizer elements and of chemicals such as ferrous, manganese, or zinc sulfates, or borax were ineffective in preventing or controlling the disorder.

The results of the irrigation experiments indicated that the incidence of crazy top was related in some way to the checking of growth from water shortage and the resumption of growth with restoration of abundant moisture. It is not indicated, however, that water shortage is the only factor involved in inducing the abnormalities characterizing the disorder. The information at hand suggests the practicability of preventing crazy top on these highly calcareous soils by irrigating with sufficient frequency to prohibit a checking of growth during the summer months.

Progress in hop disease control, R. O. Magie (*Farm Res.* [*New York State Sta.*], *3* (*1936*), *No. 1, pp. 1, 10, 11*).—The author briefly discusses work in progress with the three major hop diseases of the State, viz, downy mildew, powdery mildew, and a recently discovered virus disease which causes the plant to grow poorly and to produce fewer and smaller cones or none at all. As tested for the past 2 yr., red copper oxide was as effective as bordeaux mixture in controlling downy mildew without the stunting effects of the latter spray.

Sclerotiniose of lettuce in Arizona, J. G. Brown and K. D. Butler (*Arizona Sta. Tech. Bul. 63* (*1936*), *pp. 475–506, figs. 21*).—The cause of this disease in Arizona is said to be *Sclerotinia sclerotiorum*, *S. minor* and *S. intermedia* (causing similar conditions) not yet having been recorded for the State. The disease and its cause are described and illustrated, and the importance, the relations to environmental conditions, control, and the other hosts of the fungus are discussed in detail, with special reference to Arizona conditions. Experiments are reported which demonstrated that the commercial fertilizers commonly used in lettuce fields cannot be expected to kill the sclerotia. Sulfuric acid and a commercial disinfectant consisting of a solution of mercuric chloride in hydrochloric acid were outstanding among the soil disinfectants tested.

What is the cause of marsh spot of peas? M. P. Löhnis (*Tijdschr. Plantenziekten, 42* (*1936*), *No. 6, pp. 159–167; Eng. abs., pp. 165, 166*).—Analyses of normal and affected pea seeds showed no significant differences in boron content, but the mean values for all samples tested gave a higher manganese content in the sound than in the diseased peas. This result is considered to give presumptive support to the idea that manganese deficiency causes marsh spot.

Marsh spot in pea seeds: Is it a deficiency disease? G. H. Pethybridge (*Jour. Min. Agr.* [*Gt. Brit.*], *43* (*1936*), *No. 1, pp. 55–58*).—Following a brief review of the present literature on marsh spot, the author describes preliminary tests in which applications of manganese sulfate materially reduced the percentage of the disease in a seriously affected field. This trouble is also compared to the gray leaf disease of oats (now known to be a manganese deficiency disease), which was present adjacent to the pea planting above noted.

Pea mosaic and its relation to other legume mosaic viruses, W. J. Zaumeyer and B. L. Wade (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 3, pp. 161–185, figs. 4*).—Cross-inoculation studies indicated that the mosaic viruses of red clover, white clover, white sweetclover, and alsike clover are infectious to pea. Pea mosaic has been found wherever peas are grown, but it seems to be more serious in sections where market garden varieties are used.

Under certain environmental conditions and on certain varieties the viruses of the several legumes may produce symptoms resembling those of common pea mosaic. By use of the Dwarf Telephone, Tall Telephone, and Green Giant pea varieties, the mosaic viruses of white clover, white sweetclover, and alsike clover can be differentiated from those of pea and red clover mosaics. The symptoms induced by the mosaic viruses of pea and red clover are similar, and it is believed that the two viruses are identical. In addition to the mottled symptoms induced by all of the legume viruses when inoculated to pea, the mosaic viruses of white clover and of white sweetclover induced necrotic lesions on inoculated leaves and stems.

Susceptibility and resistance to the several viruses were studied in 42 pea varieties. The highest percentage of varieties not infected by the different viruses was found in the canning group. In addition to symptomatological differences, the several viruses can be separated on the basis of the reaction of several bean varieties and of *Vicia faba*. "Out of a total of 3,057 seeds collected from mosaic-infected pea plants, 11 produced diseased seedlings. In 1,564 plants grown from seeds collected above the point of noticeable infection, 8 were diseased, while in 539 seedlings grown from seeds collected below the point of noticeable infection no mosaic was observed."

Root rot of grey peas in Tasmania, W. L. Geach (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 2, pp. 77–87*).—A species of *Aphanomyces*, probably a strain of *A. euteiches*, was isolated from root-rotted peas, and with it the disease was reproduced on 12 varieties of peas (*Pisum* spp.) and on species of *Vicia* and *Lathyrus*. The fungus was also found on roots of subterranean clover, oats, and barley. It lives in the soil for a period at least over 2 yr. Cultural, greenhouse, and small-scale field trials gave promising results relative to control by addition of nitrogenous compounds to the soil.

The theory of plant development and the struggle against potato degeneration in the south [trans. title], T. D. Lysenko (*I͡arovizat͡sii͡a, No. 2 (1935), pp. 3–22, figs. 2*).—A Russian discussion of this problem.

Continued investigation of potato degeneration [trans. title], E. Köhler (*Landw. Jahrb., 82 (1936), No. 3, pp. 379–408*).—In two potato varieties of Silesian origin a number of viruses were frequently found, and yield determinations in the field and greenhouse indicated that leaf roll and streak for Erdgold and leaf roll for Stärkereiche are to be regarded as malignant degeneration diseases. Mild mosaic diseases of undetermined affinities also influenced tuber formation adversely in greenhouse tests with potted sets of Erdgold, but what part they play in potato degeneration in the field has not been determined. In the late varieties Erdgold and Stärkereiche, the electric potential method of Wartenberg et al. (E. S. R., 75, p. 459) failed to indicate any significant difference between normal and virus-infected tubers, but the early variety Erstling, under the influence of malignant virus diseases (especially leaf roll), showed a strong negative shift in potential. Since it is certain that the late varieties were more adversely affected by the preceding dry summer (1934) than were the early sorts, the author seeks here the basis of the difference in potential displacement between the early and late sorts.

The present state of our knowledge on biological specialization in the potato blight fungus (Phytophthora infestans) [trans. title], K. O. Müller (*Züchter, 7 (1935), No. 1, pp. 5–12, fig. 1*).—A general discussion.

The pathogenic action of a form of Fusarium oxysporum isolated from the potato [trans. title], E. Foex and M. Lansade (*Compt. Rend. Acad. Sci. [Paris], 202 (1936), No. 21, pp. 1812, 1813*).—A blight of potatoes has been observed in France for several years in which the leaves wilt and the stems topple

over, remaining green, at least at first, and later dry up. A form of *F. oxysporum* was isolated from affected plants, and with it the typical disease was reproduced.

A fungus disease of stored potatoes, N. L. ALCOCK and C. E. FOISTER (*Scot. Jour. Agr., 19 (1936), No. 3, pp. 252–257, pls. 4*).—A rot differing from the dry rot due to *Fusarium caeruleum*, described and illustrated, is reported to have caused an 80 percent loss in certain stocks of potatoes. Little is yet known as to varietal susceptibility, but 23 varieties in which the spontaneous disease has been found are listed. The causal relation was established for an apparently undescribed fungus belonging to the Sphaerioidaceae (Phomaceae), and the varieties successfully inoculated are listed. Extended cultural studies of 896 tubers yielded only 90 cases in which the present fungus and that of dry rot occurred together.

Powdery mildew of potato in New Jersey, L. O. KUNKEL (*Phytopathology, 26 (1936), No. 4, pp. 392, 393, fig. 1*).—A powdery mildew similar to one occurring in Europe and South America, and probably *Erysiphe solani*, was observed on Green Mountain potatoes at Princeton, N. J., apparently the first record for the United States.

Further field experiments on potato scab control in western New York, C. F. TAYLOR and F. M. BLODGETT (*Amer. Potato Jour., 13 (1936), No. 6, pp. 145–150*).—In this study from Cornell University all data were obtained from experiments in a region with soils of relatively alkaline reaction (usually at least pH 6.0). Formalin seed treatments consistently showed small reductions in scab as compared with control plats, while both seed and soil treatments with mercurials showed increases. In western New York tuber defects were markedly decreased by ammonium sulfate in the fertilizer. In limited trials tetrachloroethane and hexamethylenetetramine gave no promise of scab control.

The Netted Gem variety proved rather highly resistant to serious scab injury. Slight differences in resistance apparently exist within the Smooth Rural variety group. White Blossom Cobbler was considerably more resistant than Irish Cobbler.

The addition of mercury compounds to the fertilizer mixture as a control for common scab of the potato under Long Island conditions, H. S. CUNNINGHAM (*Amer. Potato Jour., 13 (1936), No. 4, pp. 100–103*).—In tests over 2 yr. under Long Island, N. Y., conditions, addition of either yellow oxide of mercury or calomel to the fertilizer mixture reduced the infestation of potatoes with scab. The proper amount of either of these compounds appears to be 4 lb. per ton. In equal amounts, yellow oxide of mercury was somewhat more effective than calomel. The yield on treated plats was slightly less in 1934, but decidedly greater in 1935.

The effect of irrigated crop rotations upon potato scab, R. W. GOSS (*Amer. Potato Jour., 13 (1936), No. 4, pp. 91–96*).—The records of 7 yr. on irrigated rotation plats at the Scotts Bluff Substation in western Nebraska indicated "that short rotations and rotations where beets immediately precede potatoes are, in general, undesirable, and that the longer rotations with alfalfa preceding potatoes are desirable, from the standpoint of both high yields and less scab. Manurial treatments are not desirable from the standpoint of scab, but are justified in short rotations because of the large increase in the yield of No. 1 size potatoes."

Studies on bacteria in rice seed, I [trans. title], H. SUZUKI (*Bot. and Zool. [Tokyo], 3 (1935), No. 4, pp. 749–760, figs. 5*).—Organisms designated as *Bacillus* A, B, and C are described in Japanese, all rod-shaped bacteria with peritrichiate flagella.

Resistance of rice varieties to stem rot, E. M. CRALLEY (*Arkansas Sta. Bul. 329 (1936), pp. 31, figs. 2*).—The results presented, based on tests over 4 yr., offer confirmatory evidence that rice varieties differ in relative susceptibility to stem rot. The short-grain varieties were, in general, less susceptible than the medium- or long-grain varieties, and the early-maturing than the late-maturing varieties. Resistance or slight susceptibility is believed to be a varietal characteristic associated only indirectly with time of maturity.

The short-grain varieties not being grown extensively in Arkansas, the possibility is suggested of using them for hybridization with some of the medium- and long-grain forms with the view of developing medium- and long-grain resistant types.

Studies on purple and brown spots on soybean seeds, J. MIYAGI (*Crop. Sci. Soc. Japan Proc., 8 (1936), No. 1, pp. 65–82*).—This disease has been ascribed by various Japanese authors to *Fusarium*, *Cercosporina kikuchii*, and to purely physiological origins, respectively. The author's studies incline him to the third theory. By cultural practices he was able largely to eliminate the disease.

Fungi of sugar beets, F. A. HODGES (*Phytopathology, 26 (1936), No. 6, pp. 550–563, figs. 4*).—Isolations and cultures were made of all the fungi found in or on some 5,000 beets grown in the field or greenhouse and in storage from various parts of the United States. *Phoma betae*, 4 *Penicillium* species, *Rhizoctonia* sp., *Acrostalagmus cinnabarinus*, *Cephalothecium roseum*, *Arthriniae* [*Arthrinium*?] sp., *Rhizopus nigricans*, 3 *Cylindrocarpon* species, *Alternaria* sp., *Mucor heterosporus*, *Sphaeropsis* sp., and 50 identified species and varieties of Fusaria were obtained.

Cultural studies of these fungi were made, using various types of media, and inoculation tests were prepared to determine their pathogenicity. Three sets of experiments were used on beets in storage. Beet seedlings growing in the field, greenhouse, and laboratory were also inoculated with these forms. Three types of rot were noted in the inoculation tests with stored beets, but relatively few of the fungi appeared to be active parasites that may be considered as important plant pathogens. Only a few of the forms mentioned in the literature were isolated, most of the fungi here listed being reported on beets for the first time and including a number of *Fusarium* spp. *Alternaria* sp. is recorded for the first time from New York State. Most of the storage rots were produced by *Fusarium* spp.

From an economic viewpoint, the fungi were divided into two main groups, viz, (1) the parasitic, including those of storage importance and those attacking the seedling stage; and (2) the saprophytic, including those producing only slight decay in stored beets and those of no economic importance.

The present situation with regard to investigations of sugar beet virus diseases [trans. title], E. W. SCHMIDT (*Zuckerrübenbau, 18 (1936), No. 1, pp. 4–13*).—This is a review, with a bibliography of 23 titles.

The boron deficiency disease of sugar beets, J. E. KOTILA (*Sugar Beet Jour., 1 (1936), No. 5, pp. 74, 75, 80, figs. 2*).—This work has been previously noted (E. S. R., 74, p. 799). In addition, the *Cercospora* leaf spot or "blight" is here differentiated from the boron deficiency disease.

Beetroot heart disease, F. GUILBERT (*Bul. Assoc. Chim., 53 (1936), No. 1, pp. 23–30, fig. 1; Fr., Eng., Ger. abs., pp. 29, 30*).—From a field study of heart rot of beets in the Seine-et-Marne district of France it appeared that, as in other countries, the disease is associated with soils rich in lime and having high pH values. Seeds bearing *Phoma* pycnidia did not necessarily spread heart rot, but on the other hand this fungus bears an undoubted causal relation. In soils favoring the disease, it is believed important to apply boron along with

suitable humus and manure in order to reduce the pH value to 7 and to obtain a more favorable water content. Data should also be obtained on the varieties showing the highest incidence.

The control of heart rot in sugar-beet, F. HANLEY and J. C. MANN (*Jour. Min. Agr.* [*Gt. Brit.*], *43* (*1936*), *No. 1*, *pp. 15–23*, *figs. 3*).—Heart rot has been known in Great Britain for some time, and serious losses from its attacks are reported. The symptoms are described, and it is said to be associated usually with alkaline soils and to be favored by dry conditions. Trials with boron dressings left no doubt us to the superiority of 14 lb. of borax per acre over the controls and a 4-lb. treatment for control of the disease, but there was much less difference between the effects of the 14- and 28-lb. applications. At present this treatment is recommended only for fields known to favor heart rot attacks, and the necessity for even distribution in the soil is emphasized.

Control of heart and dry rots of beets by boron [trans. title], K. MEYER-HERMANN (*Zuckerrübenbau*, *18* (*1936*), *No. 4*, *pp. 51–58*, *figs. 3*).—This deficiency disease was successfully controlled by applications of boron to the soil.

Tobacco diseases in 1935, P. J. ANDERSON (*Connecticut* [*New Haven*] *Sta. Bul. 386* (*1936*), *pp. 593–607*, *figs. 5*).—Observations are recorded on the incidence of and the damage from black root rot (*Thielavia basicola*), wildfire, blackfire, mosaic, and minor diseases, and progress reports are given on investigations of dead-blossom leaf spot and fungi associated with the spots and of *Pythium debaryanum* stalk rot of transplants. A more detailed account is given of "studies on pole rot, I", including a review of the literature, description of the symptoms, and a discussion of experimental results with the "freckle rot" type of pole rot, from which *Alternaria tenuis* was isolated and which the author believes to be the causal agent as far as the Connecticut Valley is concerned.

Disinfection of tobacco seed against cryptogams without loss of germinability in the seed [trans. title], C. CONSTANTINESCU (*Bul. Cult. şi Ferment. Tutunului*, *24* (*1935*), *No. 3*, *pp. 314–320*; *Fr. abs.*, *p. 320*).—In these seed-treatment tests with various fungicides, formalin, hot water, and Kerol were ineffective, injuring the seed without preventing the development of fungus spores. Better results followed the use of certain dusts—Cusisa (15 g of dust per kilogram of seed) and especially Ceresan (10 g per kilogram). The latter was more effective against fungi without lowering germinability. Dust treatment of tobacco seed is therefore recommended for practical use.

Downy mildew (blue mould) of tobacco: Its control by benzol and toluol vapours in covered seedbeds, II, H. R. ANGELL, J. M. ALLAN, and A. V. HILL (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *9* (*1936*), *No. 2*, *pp. 97–106*, *figs. 2*).—The occurrence of this disease was prevented by benzol vapor in covered seedbeds in 1935, confirming the previous fall trials (E. S. R., 74, p. 504) under conditions far more exacting than are likely to occur in ordinary practice. Under less severe conditions, toluol was almost as effective. In smaller seedbeds several petroleum fractions were tried, but under the experimental conditions the disease was not always prevented, though checked in its spread. The influence of several factors on the practical application of the method is discussed.

Chemical studies on the virus of tobacco mosaic.—VI, The isolation from diseased Turkish tobacco plants of a crystalline protein possessing the properties of tobacco-mosaic virus, W. M. STANLEY (*Phytopathology*, *26* (*1936*), *No. 4*, *pp. 305–320*, *fig. 1*).—Continuing this series (E. S. R., 74, p. 657), a crystalline protein with the properties of tobacco-mosaic virus was isolated from an extract of Turkish tobacco plants infected with this virus. The ex-

tract was prepared by grinding frozen plants, adding disodium phosphate, and pressing out the liquid. The press cake was extracted a second time with dilute disodium phosphate, and the two extracts were filtered through celite and combined. The virus protein was obtained from these extracts by precipitation with ammonium sulfate. It was reprecipitated with ammonium sulfate several times with much loss of color, and most of that remaining was then removed with lead subacetate. The virus was adsorbed on, and removed from, celite several times and then crystallized as small needles about 0.02 mm long by adding a solution of 5 percent glacial acetic acid in 0.5 saturated ammonium sulfate.

The crystalline material had the general properties of a protein, and its infectivity, chemical composition, and optical rotation were unchanged after 10 crystallizations. It was from 100 to 1,000 times more active than ordinary infectious juice preparations, 1 cc of a solution containing 10^{-9} g per cubic centimeter of the protein usually proving infectious. It reacted with sera of animals injected with a solution of the crystals or with infectious juice and failed to react with the sera of those injected with extracts from normal plants. All the evidence thus far obtained indicates the crystalline protein to be pure, or possibly a solid solution of proteins. It is therefore concluded that tobacco-mosaic virus is a protein.

Low-temperature masking of tobacco mosaic symptoms, J. Grainger (*Nature [London], 137 (1936), No. 3453, pp. 31, 32, figs. 2*).—In two tests with 6 and 10 mosaicked plants, respectively, the mottling was masked on leaves developed while the plants were held at 51° and 45° F. In preliminary tests the optimum temperature for growth of the plant under the experimental conditions lay around 75°, while the rate of movement of the virus was greatest at from 75° to 85° and was slower above or below. Apparently the temperatures for greatest activity of the plant and the virus differ.

Virus concentration in relation to acquired immunity from tobacco ring spot, W. C. Price (*Phytopathology, 26 (1936), No. 6, pp. 503–529, figs. 4*).—It was shown that the virus of ring spot multiplies in Turkish tobacco plants that have recovered from the disease. Using the number of necrotic lesions produced in leaves of Black cowpea (*Vigna sinensis*) as a measure of virus concentration, the following facts were ascertained: On the average, leaves from ring spot plants contain from 5 to 10 times as much virus as those from plants that have recovered, but the leaves of both recovered and diseased plants vary considerably in virus concentration. Healthy-appearing (basal) portions of partly recovered leaves contain considerably less virus than diseased (apical) portions of the same leaves. No evidence was obtained that apical and basal parts of either recovered or diseased leaves differ essentially in virus concentration. Fully recovered leaves contain somewhat more virus than the healthy-appearing portions of partly recovered leaves. The virus content of recovered leaves was not shown to have been increased by heavy inoculation with ring spot virus. Roots of diseased plants contain significantly more virus than roots of recovered plants. Stems of recovered and diseased plants were not shown to differ in virus concentration. Recovered plants grown through 10 generations by cuttings had somewhat less virus than recently recovered plants and much less virus than diseased plants. As a rule, inoculated leaves contain somewhat more virus than systemically diseased leaves. This difference is partly accounted for by the numbers of necrotic lesions present in such leaves, since the larger the number of lesions in an inoculated leaf the greater, in general, was its virus concentration.

Cowpea plants used for testing virus concentration varied considerably in susceptibility to the virus, the variation being greater in plants grown under different conditions. Variation among leaves on the same plants was less than that among leaves on different plants.

Black rot of tomato, Lycopersicum esculentum, caused by Alternaria sp., E. E. WARNER (*Phytopathology, 26 (1936), No. 6, pp. 530–549, figs. 8*).—Tomato black rot is shown to be due to *Alternaria* sp., the spores of which enter the fruit either through the stigma of a recently opened flower or through flesh wounds made by such mechanical injuries as insect punctures. Infection appears to spread principally by winds, but insects may transport the spores mechanically. Infection appears to occur only on the fruit, resulting in a dark-brown, leathery spot. On this spot the fungus produced not only the usual conidia but also large, round resting spores which appeared only when the fruit was badly decayed and the food scarce. The decayed fruit drops to the ground, leaving the two spore types in the soil. The winter, if severe, kills the conidia, but the resting spores live over, to be carried by wind-blown dust the following season and to reinfect the flowers of the new crop.

***Phytophthora* disease of tomatoes (toe rot),** D. V. HOWELLS (*Scot. Jour. Agr., 19 (1936), No. 1, pp. 47–50, pls. 3*).—A root rot troublesome for some years in the tomato houses of Scotland is reported as due to an unnamed species of *Phytophthora* causing a rot, chiefly at the tip of the main root. One of the chief symptoms is a wilting of the plants during the day, with revival at night. The diseased condition travels along the main root into the stem. Moisture and other soil conditions have an important influence on the course of the malady. Control measures are suggested.

Studies on the inheritance of resistance to wilt (Fusarium niveum) in watermelon, L. S. BENNETT (*Jour. Agr. Res. [U. S.], 53 (1936), No. 4, pp. 295–306, figs. 6*).—At the West Virginia Experiment Station the inheritance of resistance to *F. niveum* was found to depend on several factor pairs in crosses of the Russian and Early Fordhook—resistant and susceptible varieties, respectively. Three physiologic forms of the fungus (one highly virulent, one intermediate, and one less virulent) were used in the greenhouse tests reported. There was a slight correlation of the resistance of the various hybrids to these three forms. The Russian parent had 11 pairs of chromosomes, as has been reported for the ordinary commercial varieties.

Detailed analyses of the results and suggestions for the development of more resistant varieties are given.

Vegetable seed treatments: Chart for 1936, P. P. PIRONE (*U. S. Dept. Agr., Ext. Path. No. 21 (1936), pp. 8–11*).—This is a chart of instructions, based on recent experimental work, for seed treatment of 23 different kinds of vegetables.

The role of plums in the spread of peach virus diseases, D. CATION (*Mich. State Hort. Soc. Ann. Rpt., 65 (1935), pp. 61–63*).—The author gives a brief historical review of the virus diseases of peaches and plums and cites specific instances of the exchange of these diseases between plums and peaches in Michigan. It is concluded that "the case against the plum then is: (1) It carries the insect which is responsible for the spread of our important virus diseases; (2) it may carry these virus diseases without showing marked symptoms."

The drupaceous hosts (peach, plum, and cherry) of 11 types of virus disease, with localities, are tabulated.

Verticillium wilt of cane fruits, S. M. ZELLER (*Oregon Sta. Bul. 344 (1936), pp. 25, figs. 6*).—This important disease of western Oregon is the chief factor

limiting the yields of black raspberries to about one-third of the theoretical amounts. The symptoms are described, and the results of this study as to sources of infection, the causal organism and inoculations, the susceptibility of varieties, and control measures are detailed.

Infection usually comes through the small roots and thus is left in the soil. Many common crops and weeds are carriers, and in nurseries maples and barberries have been found infected. Of the total inoculated plants in two experimental plantings, 55.1 percent were infected when 1 yr. old, 31.1 percent when 2 yr. old, 12.4 percent when 3 yr. old, and 1.4 percent when 4 yr. old. Of the 1,877 inoculated plants, 86.5 percent became infected at some time during the test, while 52.3 percent of the controls also became infected (two-thirds of them during the third year). Of the infected plants, 1.8 percent recovered, while 37.3 percent of the inoculated and 10.3 percent of the control plants were killed by *Verticillium*. Inoculum from black raspberry infected 64.3 percent of the plants inoculated, while that from potato infected 60.2 percent. Low temperatures and continuous cold weather seemed to increase the number of plants killed by the disease. The tests indicated that infection may travel 10 ft. from plant to plant in 3 yr. In the second year 6.7 percent were infected at 9-ft. distances without intervening plants.

All varieties of black and purple raspberries proved susceptible, although some lived for several years after infection. The Cuthbert red raspberry proved very resistant, but considerable infection was observed in several other varieties tested. Among blackberries, Evergreen, Himalaya, Lawton, and wild Northwestern Trailing (*Rubus macropetalus*) appeared highly resistant, but some infection was noted in several other varieties tested. Some of the Asiatic species of *Rubus* proved highly resistant.

Tests on the viability of *V. alboatrum* on raspberry canes in the soil indicated that it can live over from one fall to the next, but that it does not continue viable much longer on dead tissues.

Roguing is not considered of value except where the infection is below at least 5 percent. Trials indicated the effectiveness of 3- or 4-yr. rotations with two or three nonsusceptible intervening crops. These methods, with the use of stock from disease-free nurseries, are the control suggestions recommended.

Raspberry diseases in the Hudson Valley, L. M. Cooley (*Farm Res.* [*New York State Sta.*], *3* (*1936*), *No. 1, p. 4*).—A brief account of a disease survey is presented as showing that mosaic control is still the principal problem of the region, and that the chief aphid vector was unusually abundant. "The main present-day varieties are Latham and Chief, both quite resistant to the effects of mosaic infection, and Newburgh, a variety to some extent mosaic-escaping." Powdery mildew was also economically serious.

Filbert blight and its control, P. W. Miller (*Oreg. Agr. Col. Ext. Bul. 486* (*1936*), *pp. 8, figs. 9*).—This is a general semipopular summary of our knowledge on this bacterial disease and its control.

Zinc content of soils in relation to pecan rosette, A. O. Alben and H. M. Boggs (*Soil. Sci., 41* (*1936*), *No. 5, pp. 329–332*).—In this study the total zinc content and reaction of 32 soil profiles were determined, and the prevalence of rosette was noted. The results obtained show that "the zinc content of the basic soils examined is generally higher than the zinc content of the acid soils, and that even though the basic soils contain appreciable quantities of zinc there is considerable rosette in pecan trees growing on these soils, indicating that the zinc is unavailable. On soils having both acid and basic horizons the trees, as indicated by rosette condition, seem to be favorably influenced by the acid

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horizons. Soils having all acid horizons support pecan trees relatively free of rosette when the soil contains a moderate quantity of zinc, indicating that this zinc is available. Acid soils containing very small quantities of zinc produce trees which rosette, indicating that the very small quantities of zinc which they contain, though available, are not sufficient for normal functioning of pecan trees. In studying the functions of zinc in the control of pecan rosette, it is indicated that the zinc content of the soil, as well as the chemical composition and the reaction of the soil, must be taken into consideration."

An apparent natural transfer of the bulb or stem nematode from clover to the strawberry plant, W. D. Courtney (*Phytopathology, 26 (1936), No. 6, pp. 607–609, figs. 2*).—Uninfested Marshall strawberry plants became infested with *Anguillulina dipsaci* in a field formerly in heavily infested red clover but in which strawberries had never before been grown. A check on the source of the mother strawberry plants failed to reveal any nematode infestation or history, and other strawberry growers securing their stock at the same time and place had no nemic infestation in their fields.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The variation of animals in nature, G. C. Robson and O. W. Richards (*London and New York: Longmans, Green & Co., 1936, pp. XVI+425, pls. 2, figs. 30*).—The several chapters of this work deal with the origin of variation, the categories of variant individuals, the distribution of variants in nature, isolation, correlation, natural selection, other theories of evolution, and adaptation.

Animal micrology: Practical exercises in zoölogical micro-technique, M. F. Guyer (*Chicago: Univ. Chicago Press, 1936, 4. ed., rev., pp. XVI+331, figs. 76*).—A fourth edition of the work previously noted (E. S. R., 37, p. 155), including a chapter on drawing by E. A. (Smith) Bean (pp. 183–194).

The reproductive processes of certain mammals, IV–VII (*Roy. Soc. London, Phil. Trans., Ser. B, 222 (1933), No. 485, pp. 47–96, pls. 7, figs. 15; 223 (1934), Nos. 499, pp. 239–276, pls. 7, fig. 1; 500, pp. 277–303, pls. 4, figs. 14*).—These several parts (E. S. R., 69, p. 35) deal, respectively, with the oestrous cycle of the gray squirrel (*Sciurus carolinensis*), by R. Deanesly and A. S. Parkes (pp. 47–78); changes in the reproductive organs of the male gray squirrel (*S. carolinensis*), by M. Allanson (pp. 79–96); the reproductive cycle of the female hedgehog (*Erinaceus europaeus*), by R. Deanesly (pp. 239–276); and seasonal variation in the reproductive organs of the male hedgehog, by M. Allanson (pp. 277–303).

The reproductive processes of certain mammals.—VIII, Reproduction in foxes (Vulpes spp.), I. W. Rowlands and A. S. Parkes (*Zool. Soc. London Proc., 1936, IV, pp. 823–841, pls. 6, figs. 2*).—This study of the histophysiology of reproduction in the British red fox (*V. vulpes*) and in the silver fox, a mutant of the American red fox (*V. fulva*) and now kept extensively in captivity, showed no obvious difference in the reproductive processes of the two species.

Differential browsing by deer on plots variously fertilized, H. L. Mitchell and N. W. Hosley (*Black Rock Forest Papers, 1 (1936), No. 5, pp. 24–27, figs. 2*).—The data presented in this report are discussed with special reference to the reasons why deer apparently relish browse of a certain type on one site but almost completely ignore the same species growing on others.

Distribution of the badger (Meles meles) around Denbigh, with notes on its food and habits, G. Davies (*Jour. Anim. Ecol., 5 (1936), No. 1, pp. 97–104, fig. 1*).—The badgers examined by the author were found to have eaten

rabbits (*Oryctolagus cuniculus*), dorbeetles (*Geotrupes stercorarius*), wheat, oats, and acorns. Other observations indicate that nests of bees and wasps are raided and pheasant eggs, poultry, and earthworms consumed.

Food habits of the mink in New York, W. J. HAMILTON, JR. (*Jour. Mammal., 17 (1936), No. 2, p. 169*).—A visceral analysis of 70 mink collected in New York during the trapping season, November to March, 1927–34, inclusive, has shown mice (chiefly *Microtus*) to have been the prey of 32.94 percent, fish of 18.82, crawfish of 16.47, muskrat of 14.12, rabbits of 4.71, insects of 7.06, frogs of 2.36, mole (*Condylura*) of 2.36, and grasses of 1.18 percent.

Breeding rates of domestic rats trapped in Lagos, Nigeria, and certain other countries, P. A. BUXTON (*Jour. Anim. Ecol., 5 (1936), No. 1, pp. 53–66, figs. 2*).—In the compilation here presented particular attention is given to sex ratios and to seasons in which the breeding of brown and black rats is more or less intense. A list is given of 23 references to the literature.

Identification of rats damaging cane in Queensland canefields, W. A. McDOUGALL (*Cane Growers' Quart. Bul. [Queensland], 3 (1936), No. 4, pp. 141–144, figs. 3*).—Three species of rats, namely, *Rattus rattus*, *R. culmorum*, and *Melomys littoralis*, were found to be of importance to the sugarcane farmer in Queensland. Exceptionally heavy rat damage was experienced in the Herbert River cane areas in 1933 and 1934.

Raising game birds, H. MITCHELL (*Philadelphia: Penn Pub. Co., 1936, pp. XIII+15–315, pls. 8, figs. 20*).—A practical work which takes up the mallard ducks, ring-necked pheasants, quail, bantams, ornamental fowl, and wild geese.

The 1935 international wild duck census (*New York: More Game Birds in Amer., [1935], pp. 79, pls. 2, figs. 62*).—A report on the duck population in Alberta, Saskatchewan, Manitoba, North Dakota, South Dakota, and Minnesota during August 1935.

Some observations on the ruffed grouse in Wisconsin, W. GRANGE (*Wilson Bul., 48 (1936), No. 2, pp. 104–110, fig. 1*).—Observations of *Bonasa umbellus togata* L. in Rusk County, Wis., during the years 1919–30 are reported.

Notes on the winter food of the short-eared owl, I. R. TOMKINS (*Wilson Bul., 48 (1936), No. 2, pp. 77–79*).—A list is given of 15 bird species identified from 38 individuals that have been eaten by *Asio flammeus flammeus*, based upon pellets collected during the winter of 1930 on the dunes and marshes about the Savannah River, Ga., entrance. Sixty-eight pellets examined at various times during the following winter contained the remains of 96 house mice (*Mus musculus*) and 4 rats of the genus *Rattus*, which were most likely the roof rat (*R. alexandrinus*), though the Norway rat (*R. norvegicus*) and the black rat (*R. rattus*) are also to be found in this territory.

The American woodcock (Philohela minor (Gmelin)), O. S. PETTINGILL, JR. (*Mem. Boston Soc. Nat. Hist., 9 (1936), No. 2, pp. 169–391, pls. 10, figs. 7*).—A monographic account of *P. minor*, presented with a bibliography of 35 pages.

Oceanic birds of South America, I, II, R. C. MURPHY (*New York: Amer. Mus. Nat. Hist., 1936, vols. 1, pp. XXII+640, pls. 44, figs. 61; 2, pp. 641–1245, pls. 44, figs. 19*).—Part 1 of this report upon the species of the related coasts and seas, including the American quadrant of Antarctica, based upon the Brewster-Sanford collection in the American Museum of Natural History, considers the physical environment (pp. 1–322) and part 2 the oceanic birds (pp. 323–1178). A bibliography of 32 pages is included. The work is illustrated from paintings by F. L. Jaques (16 plates), maps, and other drawings.

The birds of Nippon, Vol. I, pt. 5, PRINCE TAKA-TSUKASA (*London: H. F. & G. Witherby; Tokio: Yokendo, 1935, vol. 1, pt. 5, pp. LXI–LXXVI+239–290, pls. 7*).—This is a continuation of the work noted (E. S. R., 73, p. 338).

A key to the lizards of the United States and Canada, C. E. BURT (*Kans. Acad. Sci. Trans., 38 (1935), pp. 255–305, figs. 71*).—Following a brief introductory account and glossary of terms, a descriptive key is given to the lizards of the United States and Canada, followed by 71 figures illustrating their structure and a check list of those recorded from the United States and Canada. A list of 35 references to the literature and an alphabetical list of these lizards are included.

Food habits of Skull Valley lizards, G. F. KNOWLTON and W. L. THOMAS (*Copeia, No. 1 (1936), pp. 64–66*).—This contribution from the Utah Experiment Station reports briefly upon the food habits of eight forms of lizards as observed in Skull Valley, Tooele County, Utah. This is a breeding ground of the beet leafhopper, the principal hosts of which are Russian thistle (*Salsola pestifer*) and blistercress (*Cheirinia repanda*). The data obtained indicate that most of the insectivorous lizards are voracious feeders, and that the injurious insects consumed each year by each individual lizard will undoubtedly exceed its weight many times.

Notes on the parasite fauna of Cuba.—I, Vermes [trans. title], I. PÉREZ VIGUERAS (*Mem. Soc. Cubana Hist. Nat. "Felipe Poey", 9 (1935), Nos. 1, pp. 45–49; 2, pp. 59–66; 10 (1936), No. 2, pp. 53–86*).—This contribution presents notes on 144 forms, largely parasites of animals, including their hosts, habitat, geographical occurrence, etc. A host list of these parasites and a list of 130 references to the literature are included.

Molluscan intermediate hosts of the Asiatic blood fluke Schistosoma japonicum and species confused with them, P. BARTSCH (*Smithsn. Misc. Collect., 95 (1936), No. 5, pp. 60, pls. 8*).—This contribution is accompanied by a list of 47 references to the literature.

An epidemiological study of protozoa parasitic in wild rats in Baltimore, with special reference to Endamoeba histolytica, J. ANDREWS and H. F. WHITE (*Amer. Jour. Hyg., 24 (1936), No. 1, pp. 184–206, figs. 2*).—Examinations for protozoan parasites were made of more than 2,500 wild Norway rats (*Rattus norvegicus*) caught alive in Baltimore, Md., the incidences for each species being determined and analyzed when feasible from the standpoints of geographical distribution, age of host, and seasonal variation.

Trichomonas parva, *Trypanosoma lewisi*, and the coccidia occurred more frequently in juvenile than in adult rats. *Sarcocystis* sp. was almost exclusively a parasite of adult rats. Seasonal differences in prevalence, independent of age and geographic modification, were shown with *T. lewisi* and the coccidia. Similar but less conclusive evidence of seasonal variation was shown for *T. parva*. These species occurred least frequently in the winter months. The maximum incidence of the coccidia was in the spring, of *T. lewisi* in the summer, and of *T. parva* in the summer and fall. Factors which may have influenced these findings are discussed.

"Twenty-eight rats were found to be infected with an ameba believed to be *E. histolytica*. In view of the low incidence (1.1 percent) of this organism, considered in relation to other factors concerned in its possible transfer to man, it is concluded that as a reservoir of human amebiasis the rat is of negligible importance."

A four-page list of references to the literature is included.

A helminthological survey of Baltimore house rats (Rattus norvegicus), G. W. LUTTERMOSER (*Amer. Jour. Hyg., 24 (1936), No. 2, pp. 350–360, fig. 1*).—In the course of the examination of 2,636 rats (*R. norvegicus*) from the city of Baltimore, 11 species of helminths were found. The percentage incidence of these forms in the 2,500 adult animals examined was as follows: *Cysticercus*

fasciolaris 19.2, *Hymenolepis diminuta* 16.6, *H. nana fraterna* 11.4, *Trichosomoides crassicauda* 90.4, *Capillaria hepatica* 85.6, *Strongyloides ratti* 20.2, *Nippostrongylus muris* 16.8, *Heterakis spumosa* 1.6, *Trichinella spiralis* 1.2, *Syphacia obvelata* 0.48, and *Moniliformis moniliformis* 0.64.

The low incidence of *T. spiralis* suggests that rats are not an important factor in the dissemination of human trichina infection in Baltimore. *M. moniliformis* is reported for the first time in Baltimore rats.

Introduction to human parasitology, A. C. CHANDLER (*New York: John Wiley & Sons; London: Chapman & Hall, 1936, 5. ed., rewritten and enl., pp. XVI+661, figs. 308*).—A rewritten and enlarged edition of this work (E. S. R., 64, p. 154).

An improvement in staining technic for Protozoa, D. L. SARGENT (*Stain Technol., 11 (1936), No. 2, pp. 49–52; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, p. 59*).—An account is given of a modification of R. Donaldson's iodine-eosin stain for staining intestinal Protozoa which consists in the use of high dilutions of colloidal iodine as suggested by Chandler (E. S. R., 57, p. 179) instead of Lugol's solution, as well as high dilutions of eosin. A better resolution of the external and internal structures is brought about by the new method. The procedure is as follows:

"A portion of the fecal material to be examined is suspended in a 0.6 percent salt solution; the suspension should be of a consistency so that 1 drop will make a satisfactory microscope mount under a cover glass. To 10 parts of this suspension, in a test tube, is added 1 part of the stain, which is prepared as follows: 10 parts of distilled water, 6 parts of a suspension of colloidal iodine (Chandler) containing 4 percent iodine—20 percent iodine suspensoid (Merck), 1 part of a 10 percent water solution of aniline red (Merck) (eosin yellowish).

"Because iodine in the form of colloidal iodine is readily released to the organisms, technicians will find that the use of this material is far superior to Lugol's solution in carrying out the technic for staining intestinal Protozoa in the study of fresh mount preparations. Not only are organisms more deeply stained with iodine but by eosin as well, even when employed in high dilutions."

Further studies of interaction between predators and prey, G. F. GAUSE, N. P. SMARAGDOVA, and A. A. WITT (*Jour. Anim. Ecol., 5 (1936), No. 1, pp. 1–18, figs. 6*).—Observations on the interaction (1) between two species of mites, one of which, namely, *Cheyletus eruditus*, feeds upon the other, *Aleuroglyphus agilis*; (2) between *Paramecium* and yeast cells; and (3) between *Paramecium* and *Didinium* are reported.

Viviparity in insects, A. B. KLOTS (*Jour. N. Y. Ent. Soc., 44 (1936), No. 1, pp. 79, 80*).—A similar account by Hagan has been noted (E. S. R., 73, p. 641).

The toxicogenic and toxiniferous insect, W. CARTER (*Science, 83 (1936), No. 2161, p. 522*).—Contributing from the Hawaiian Pineapple Producers' Experiment Station, the term "toxicogenic" is proposed for insects which have a specific toxic effect upon the plant and the inheritance of such a capacity. It is pointed out that a toxicogenic insect may not always be capable of secreting toxins, since such toxins may only arise as a result of specific or limited nutritional conditions. The term "toxiniferous" is proposed as descriptive of the active toxin-secreting condition of a toxicogenic insect. This term was first used by the author and Schmidt without amplification in a recent paper (E. S. R., 74, p. 668) to describe the pineapple mealybug.

Presidential address: The evolution of social life in insects, F. BALFOUR-BROWNE (*Jour. Roy. Micros. Soc., 56 (1936), No. 1, pp. 1–11, fig. 1*).—An address in which the author outlines the manner in which in different groups of in-

sects the same types of habits have appeared and developed along parallel lines.

The fourth annual summary of the more important insects of Kansas covering the year 1934, R. C. Smith and E. G. Kelly (*Kans. Acad. Sci. Trans., 38 (1935), pp. 171–185*).—This annual summary (E. S. R., 71, p. 809) is contributed from the Kansas Experiment Station.

[Report of insect studies at the Utah Station] (*Utah Acad. Sci., Arts, and Letters, Proc., 12 (1934–35), pp. 229–239, 243, 245–260, 263, 264, fig. 1*).—Contributions from the Utah Experiment Station include the following: Grasshopper Egg-Deposition Survey of Utah, 1934, by W. W. Henderson and E. Gardner (pp. 229–232, 243); Studies Upon the Morphology of *Paratrioza cockerelli* (Sulc), by J. A. Rowe and G. F. Knowlton (pp. 233–239); Notes on Utah Mosquitoes, by G. F. Knowlton and J. A. Rowe (pp. 245–247); Beet Leafhopper Predators—Birds, by G. F. Knowlton and C. F. Smith (pp. 249–253); Beet Leafhopper Insect Predator Studies, by G. F. Knowlton (pp. 255–260); and Insect Food of Troutcreek Lizards, by G. F. Knowlton and W. L. Thomas (pp. 263, 264).

Insect pests of crops, 1932–1934, J. C. F. Fryer (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 99 (1936), pp. VI+50, fig. 1*).—Following a discussion of the development and methods of insect control, a brief reference is made to introduced pests, with general notes, a tabular list of records (pp. 13–35), and a list of references.

Insect and other pests of 1935, A. E. Cameron (*Highland and Agr. Soc. Scot. Trans., 5. ser., 48 (1936), pp. 82–121, figs. 26*).—This is the annual contribution on the pests of major importance in Scotland (E. S. R., 73, p. 644).

Report of the imperial entomologist, P. V. Isaac (*Imp. Inst. Agr. Res., Pusa, Sci. Rpts., 1933–34, pp. 168–174*).—Work with the most important insect enemies of sugarcane and other crops, together with the results of the insect survey, etc., are reported upon.

Tobacco insects in 1935, D. S. Lacroix (*Connecticut [New Haven] Sta. Bul. 386 (1936), pp. 587–592, figs. 3*).—In reporting further (E. S. R., 73, p. 206), reference is made to the prevalence of insect enemies of tobacco in 1935 and the results of control work with the tobacco budworm, tobacco flea beetle (including flea beetle resistant tobacco), and tobacco thrips.

Controlling beetles in warehoused leaf, W. D. Reed and E. M. Livingstone (*Tobacco, 102 (1936), No. 26, pp. 11, 12, figs. 2*).—This is a practical account dealing with the cigarette beetle and also with the tobacco moth, the principal pests attacking cured leaf tobacco and manufactured tobacco products.

The annual wheat insect survey and what it reveals, T. H. Parks (*Ohio Sta. Bimo. Bul. 182 (1936), pp. 107–109, figs. 2*).—In the annual survey (E. S. R., 74, p. 229), in which 328 wheatfields in 33 counties were inspected, the average hessian fly infestation for the counties visited was 12.4 percent as compared with 26.4 in 1935. The percentage of straws infested by the hessian fly averaged from as low as 1.4 in Wood County to as high as 50.8 in Butler County. Chinch bugs were found in a few eastern Ohio fields. The black wheat-stem sawfly, a report upon which is noted on page 226, again seriously injured wheat in eastern Ohio. The wheat jointworm was not serious in this section of the State. Maps which indicate the percentage of wheat straws infested by the hessian fly in the several counties visited and hessian fly-free seeding dates are included.

Flour-mill insects and their control, G. A. Dean, R. T. Cotton, and G. B. Wagner (*U. S. Dept. Agr. Circ. 390 (1936), pp. 34, figs. 24*).—This general discussion of cereal product insects, contributed from the Bureau of Entomology

and Plant Quarantine and the Kansas Experiment Station cooperating, deals with the subject under the headings of insect pests of stored grain, in the flour mill, and in the warehouse; infestations of flour in transit; and insect control in returned goods and used bags.

False codling moth and fruit-fly as pests of citrus in the western Transvaal, A. J. Smith (*Farming in So. Africa, 11 (1936), No. 122, pp. 189, 190*).—Control work with the Mediterranean fruitfly and *Ceratitis* (*Pterandrus*) *rosa* Ksh. (known as the false codling moth), and with the fruitfly *Argyroploce leucotreta* Meyr. (of minor importance as an enemy of citrus in the western Transvaal), is briefly reported upon, the details being given in four tables.

Citrus mealy bugs and ants on grapefruits, H. Z. Klein (*Hadar, 9 (1936), No. 2, pp. 42, 43, figs. 4*).—Particular mention is made of the citrus mealybug as one of the main citrus pests all along the coastal plain of Palestine and its attendance by *Cremastogaster* (*Acrocoelia*) *jehovae* For. It is found on many other plants in Palestine, but causes no noticeable damage. It has spread over the country with the exception of the southern part of the Jordan Valley.

Entomological notes, J. L. Froggatt (*New Guinea Agr. Gaz., 2 (1936), No. 1, pp. 10–14*).—These notes relate to coconut pests, particularly the beetles *Promecotheca antiqua* Wse. and *Brontispa froggatti* Sharp., and to insect enemies of the sweetpotato.

Insecticides and fungicides, R. C. Roark ([*Natl. Res. Council*], *Ann. Survey Amer. Chem., 10 (1935), pp. 253–279*).—The progress made in work with insecticides and fungicides during 1934 and 1935 is reviewed, with 360 references to the literature.

Continue studies on chemistry of calcium arsenates, G. W. Pearce (*Farm Res.* [*New York State Sta.*], *3 (1936), No. 1, pp. 9, 10*).—This practical account is based upon studies the details of which have been noted (E. S. R., 75, pp. 8, 80).

The work has led to the preparation of a relatively safe calcium arsenate thought to be essentially basic calcium arsenate plus 5 to 10 percent free or uncombined lime. This product is said to have been made on a semicommercial scale and tested extensively in the field during the season of 1936 from the standpoint of both safeness to foliage and effectiveness in insect control. Preparations that are relatively safe for orchard use and believed to be basic calcium arsenate have been developed and are now being manufactured commercially by at least five companies.

Spray recommendations in regard to residue load and injury from lead, calcium, and zinc arsenates, W. C. Dutton (*Mich. State Hort. Soc. Ann. Rpt., 65 (1935), pp. 36–39*).—Analyses of residues from fruits sprayed for codling moth control in 1934 and 1935 and the injury to fruit and foliage of the Jonathan variety of apple in 1935 are reported in tables.

Fish-poison plants as insecticides: A review of recent work, F. Tattersfield (*Empire Jour. Expt. Agr., 4 (1936), No. 14, pp. 136–144*).—This review contributed from the Rothamsted Experimental Station is accompanied by a list of 45 references to the literature.

New contact insecticides from fatty alcohols, E. W. Bousquet, P. L. Salzberg, and H. F. Dietz (*Indus. and Engin. Chem., 27 (1935), No. 11, pp. 1342–1344, figs. 7*).—In work aimed at the production of a synthetic organic product superior to the plant extractives now used, the rhodanates of the higher fatty alcohols proved to be the most satisfactory from the standpoint of efficiency, safety to foliage, and practicability. The paper outlines briefly the chemistry of these compounds and deals more specifically with the striking relationship which has been found to exist between molecular weight and toxicity and which has been used as the basis for selecting the most satisfactory product.

Rearing codling moth larvae for testing insecticides, M. D. Farrar and E. R. McGovran (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 245–247*).—This account of the methods employed by the Illinois Experiment Station in rearing codling moth larvae for testing insecticides supplements that of Farrar and Flint previously noted (E. S. R., 63, p. 459).

Study light traps for control of insects, D. L. Collins (*Farm Res. [New York State Sta.], 3 (1936), No. 1, pp. 1, 12, figs. 3*).—Reference is made to the progress (E. S. R., 74, p. 815) of a series of experiments with light traps conducted with a view to determining their value in codling moth control.

In the lighted portion of the Rome Beauty orchard at the station the use of a light trap of the electrocution type illustrated has resulted in a reduction in the amount of codling moth injury which appears to be equivalent to that achieved through the use of one, or perhaps two, cover sprays. It is pointed out that the conclusions drawn by earlier workers may have to be revised since many insects are strongly attracted to blue or violet lights but are not sensitive to any great extent to the yellow of oil or tallow flames.

The penetration of gaseous pyridine, piperidine, and nicotine into the body of the American cockroach, Periplaneta americana L., L. H. Glover and C. H. Richardson (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 249–260, figs. 6*).—In the authors' study the American cockroach was treated with pyridine, piperidine, and nicotine in the gaseous state. "Entire insects, parts, and tissues were extracted, and the compounds were detected and their concentrations were determined in the extracts. On the basis of the products, outside concentration × concentration in the body for 50 percent mortality × time for 50 percent of mortality, the compounds show the following order of toxicity: Nicotine>piperidine>pyridine. This is the order of their toxicity and of their known physiological action upon vertebrate animals. The approximate concentrations in the bodies of the cockroaches when 50 percent were dead and the times for 50 percent mortality are as follows: Pyridine 2.9 mg/g in 51 min., piperidine 1.0 mg/g in 12.5 min., and nicotine 1.2 mg/g in 860 min. These compounds appear to enter the body largely through the cuticula. The ventral nerve cord does not take up as much nicotine as the cuticula and no more than the large muscles, fat body, and the tissues of the digestive tract. The ventral nerve cord accumulates as much pyridine as the cuticula; the digestive tract tissues and the fat body less. The muscle showed only a small amount of pyridine. Likewise, the ventral nerve cord and the cuticula showed about equal quantities of piperidine. There was a markedly large amount of piperidine in the muscles, whereas a relatively smaller amount was found in the fat body."

A list is given of 32 references to the literature.

Locust destruction, P. R. Viljoen (*Farming in So. Africa, 10 (1935), No. 117, pp. 502–504*).—This is a report upon control work with the migratory (particularly brown and red) grasshoppers conducted during the year ended August 31, 1935.

Studies on the desert locust (Schistocerca gregaria Försk.) in central Asia and Transcaucasus in 1929–1930, compiled by S. A. Predtechenskiĭ (Predtechensky) (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect.), Ent., No. 11 (1935), pp. 92, figs. 6; Eng. abs., pp. 85–91*).—A report on the life history and habits of *S. gregaria*.

The annual cycle of the desert locust (Schistocerca gregaria Försk.), its migrations and periodicity in Persia and adjacent countries of tropical and subtropical Asia, S. A. Predtechenskiĭ (Predtechensky) (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect.,*

Bul. Plant Protect.), Ent., No. 12 (1935), pp. 135, figs. 49; Eng. abs., pp. 123–134).—This report is accompanied by a list of 42 references to the literature.

Injurious locusts in U. S. S. R.: Review of the years 1925–1933, S. A. PREDTECHENSKIĬ (PREDTECHENSKY), S. P. ZHDANOV, and A. A. POPOVA (*Inst. Zashch. Rast., Trudy Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Bul. Plant Protect.), Ent., No. 18 (1935), pp. 167, figs. 17; Eng. abs., pp. 153–165).*—A summary of data on the geographical and stationary distribution of grasshoppers (*Locusta migratoria* L., *Schistocerca gregaria* Försk., and *Dociostaurus maroccanus* Thunb.) in the U. S. S. R., the districts of pest activity and dates of development of some of the injurious locusts, their dynamics and abundance, and methods of control, as well as crops damaged during the period 1925–33, and a generalization on the solitary grasshoppers are accompanied by a four-page list of references to the literature.

The relation of humidity and temperature to the development of three species of African locusts: Locusta migratoria migratorioides (R. & F.), Schistocerca gregaria (Försk.), Nomadacris septemfasciata (Serv.), A. G. HAMILTON (*Roy. Ent. Soc. London, Trans., 85 (1936), No. 1, pp. 1–60, pls. 2, figs. 26).*—This contribution is presented with a list of 44 references to the literature.

A study of the biology of the flower thrips (Frankliniella tritici (Fitch)), with special reference to cotton, J. G. WATTS (*South Carolina Sta. Bul. 306 (1936), pp. 46, figs. 10).*—A study of the biology and control of the flower thrips, which causes serious damage to cotton in certain areas of South Carolina at irregular intervals, is reported upon. Of the 11 species of thrips found on cotton, the flower thrips is considered the most destructive. The tobacco thrips, the onion thrips, and *Sericothrips variabilis* (Beach) are of lesser importance. *Aeolothrips bicolor* Hinds and *Leptothrips mali* (Fitch) have been reported as predaceous on certain other thrips, mites, and aphids. The grass thrips, *F. williamsi* Hood, *Limothrips cerealium* Haliday, and *Echinothrips americanus* Morg. are not known to cause noticeable injury to cotton. *Liothrips* sp. (possibly new) was represented by a single specimen.

"Life history studies of the flower thrips were made through 65 generations. There was a decided variation in the duration of instars during various seasons, but the averages were as follows: Egg, 3.31 days; first larval, 2.20 days; second larval, 2.80 days; prepupa, 1.13 days; pupa, 2.45 days; and total development, 11.83 days.

"A study of the host plants of the flower thrips showed that the plants attacked are numerous and varied, but there seems to be a preference for plants belonging to the grass, legume, and rose families, with a noticeable but less decided preference for plants of the composite and mustard families. Large numbers are most often found in flowers, but the foliage of certain plants is often severely damaged.

"Thrips injury to cotton in South Carolina was negligible after it had reached the age of about 6 weeks. Vegetation and possibly soil types have some influence on the thrips population in a given area. All stages of the flower thrips are quite resistant to low temperatures. No insect parasites were found. The insidious flower bug *Orius insidiosus* Say, the convergent ladybeetle (*Hippodamia convergens* Guerin), and a species of lacewing (*Chrysopa* sp.) are predatory enemies of the flower thrips. Heavy, dashing rains are probably the most important natural control. No practical insecticidal control of thrips on cotton is known at present." Cultural practices which are considered of value in reducing the population and injury include early planting of cotton, clean culture throughout the year, growing as far removed

from forage and cover crops as possible, and the promotion of rapid growth from the start.

Four new Thysanoptera, with a preliminary list of the species occurring in Iowa, D. Moulton and F. Andre (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 223–234, figs. 9*).—This contribution from the Iowa Experiment Station records 85 species of Thysanoptera as occurring in Iowa, 4 of which are described as new to science under the names *Frankliniella andropogoni*, *Eurythrips flavacinctus*, *Hoplothrips flavus*, and *H. quercus*. Host and locality records are included.

Italian Thysanoptera: An anatomomorphological and biological study of the olive liothrips (Liothrips oleae Costa) [trans. title], A. Melis (*Redia, 21 (1935), pp. 1–187, pls. 8, figs. 48*).—This report of studies is presented with a list of 110 references to the literature.

Variegated coffee bug (Antestia spp.) in Uganda, H. Hargreaves (*East African Agr. Jour., 1 (1936), No. 6, pp. 448–452*).—A combination of spray and baiting during suitable periods with hand collection between such periods is thought likely to prove the most suitable means of control for *A. lineaticollis* and *A. faceta* by non-native planters in Uganda.

The long-horned tree-hopper of coco-nuts (Sexava spp.), J. L. Froggatt (*New Guinea Agr. Gaz., 1 (1935), No. 1, pp. 16–27*).—An account is given of the life history and habits, indigenous parasites, and means of control of two species of *Sexava* treehoppers (*S. nubila* St. and *S. novae-guinea* Brancs) of importance as enemies of coconuts. The *Sexava* egg parasite *Leefmansia bicolor*, introduced from Amboina, is said to have become established in the field in two areas.

Leafhoppers of Ohio Erythroneura of the obliqua group (Homoptera: Cicadellidae), D. M. Johnson (*Ohio State Univ., Abs. Doctors' Diss., No. 17 (1935), pp. 107–113*).—An author's abstract is given of a contribution in which 59 species of the leafhoppers of the *obliqua* group of the genus *Erythroneura* are recognized from Ohio, of which 18 are new. The host plants of a number of the species have been determined.

Notes on two injurious psyllids and their control, W. V. Harris (*East African Agr. Jour., 1 (1936), No. 6, pp. 498–500, figs. 4*).—Two psyllid species injurious to economic plants in Tanganyika, namely, *Spanioza erythreae* Del Guercio=*Trioza merwei* Pettey, on citrus and *Phytolyma lata* Walk. on mvule, are dealt with.

Development-temperature correlation in the green bug (Toxoptera graminum), F. M. Wadley (*Jour. Agr. Res.* [*U. S.*], *53 (1936), No. 4, pp. 259–266, figs. 3*).—A statistical analysis was made of the rate of development of the green bug in relation to temperature. Several curves were fitted to the developmental rate and temperature, and standard errors of estimate were calculated. A straight line proved a better expression of the development-temperature correlation than concave curves, but considerable evidence was found that an elongate S-shaped curve may be still better. A freehand curve of this shape was the best fit, but a segment of a cubic parabola gave good results.

Some injurious plant lice of the American elm, G. M. List and C. P. Gillette (*Colorado Sta. Press Bul. 89 (1936), pp. 7, figs. 3*).—A practical account is given of the elm leaf-roll aphid, elm leaf-cluster louse (*Eriosoma rosetti* Gill. or woolly apple aphid), elm cockscomb gall aphid *Tetraneura graminis*, and the elm honeydew aphid *Myzocallis ulmifolii*.

The aphid genus Epameibaphis in Utah, G. F. Knowlton and C. F. Smith (*Ent. Soc. Wash. Proc., 38 (1936), No. 5, pp. 89–92, fig. 1*).—In this contribution from the Utah Experiment Station, descriptions are given of three species of

the aphid genus *Epameibaphis* recognized from Utah, of which one is described as new under the name *E. utahensis.*

A winter clean-up program against aphids, J. R. WATSON (*Citrus Indus., 16 (1935), No. 12, pp. 20, 21*).—A practical contribution from the Florida Experiment Station.

The gold-banded skipper Rhabdoides cellus, A. H. CLARK (*Smithsn. Misc. Collect., 95 (1936), No. 7, pp. 50, pls. 8, figs. 8*).—The synonymy of this lepidopteran, its range and distribution, named varieties, morphology, and biology are reported upon. It is said to have been observed feeding on hydrangea. Keys to the eggs, caterpillars at birth, and mature caterpillars of *Rhabdoides* and related genera are included.

The feeding-habits of the adult Lepidoptera Heteroneura, M. J. NORRIS (MRS. O. W. RICHARDS) (*Roy. Ent. Soc. London, Trans., 85 (1936), No. 2, pp. 61–90*).—This contribution is presented with a five-page list of references to the literature.

The gipsy moth (Porthetria dispar L.) in Eurasia, Africa, and New England [trans. title], K. E. SCHEDL (*Monog. Angew. Ent., No. 12 (1936), pp. IV+242, figs. 95*).—This monographic account is presented with a list of 600 references to the literature.

An outbreak of the beet webworm (Loxostege sticticalis L.) in western Kansas in 1934, D. A. WILBUR (*Kans. Acad. Sci. Trans., 38 (1935), pp. 187, 188*).—A widespread outbreak of the beet webworm which occurred over the western two-thirds of the State during the late summer and fall of 1934 is reported upon in this contribution from the Kansas Experiment Station.

Projected biological attack on diamond-back moth in New Zealand, T. G. TYRER (*Dairy Exporter [New Zeal.], 11 (1936), No. 11, pp. 38–40, figs. 5*).—This is a discussion of introductory parasite control work with the diamondback moth in New Zealand, where normal parasitism by *Angitia lateralis* and an undetermined native species has been approximately 7 percent. In introductions to be made from England and Europe *A. fenestralis* and *A. cerophaga* are thought to be the most promising. Reference is made to the 90-percent control of the imported cabbageworm by the pupal parasite *Pteromalus puparum* introduced into New Zealand from Great Britain some 6 or 7 yr. ago.

Recent experiments in the control of the pecan nut case bearer in the Southeast, G. F. MOZNETTE (*Southeast. Pecan Growers Assoc. Proc., 29 (1935), pp. 37–39, 40*).—Experiments conducted in the southeastern United States during the years 1932–34 indicated that the pecan nut casebearer can be controlled effectively through the use of nicotine with oil emulsion and nicotine with fish oil. A single application of nicotine-oil gave a control nearly equal to that obtained from two applications. Summer oil emulsion used alone was not effective. Grading data secured at harvest indicated that more than one application of a nicotine oil spray may not be advisable, two applications apparently having produced an increase in the proportion of pecan nuts of the smaller sizes.

The influence of ecological factors on the Mediterranean flour moth (Ephestia kühniella) and its parasite Nemeritis canescens, T. AHMAD (*Jour. Anim. Ecol., 5 (1936), No. 1, pp. 67–93, figs. 4*).—The author has found that the reproductive potential and development of the Mediterranean flour moth are adversely affected by high temperature (above 23° C.) and high saturation deficiency (above 14 mm). "Under these conditions the adults exhibit a marked degree of sterility and the larval and pupal stages show a high mortality, but the viability of the eggs is only slightly affected. *N. canescens* being an endoparasite, its reproductive potential is affected neither by s[aturation] d[eficiency] nor appreciably by temperature.

"The host possesses two strains. Their threshold of development lies between 8° and 10°; that of the parasite between 12° and 15°. In the absence of food *Nemeritis* adults are only short-lived; by feeding them on honey solution life is considerably prolonged, the maximum being 80 days at 18°. At 23° and above, both on account of its quicker development and higher reproductive potential, the parasite can overtake the host; at 18° and under, the reproductive potential of the parasite falls below that of the host and the rate of development is also greatly reduced; thus high temperature favors the parasite, low temperature favors the host.

"While the host is susceptible to parasitization only during a limited period in development, the mixture of strains prevailing results in the continuous presence of the host in the right condition. The long life of the parasite in the presence of food also carries it over, should there be a temporary scarcity of suitable stage of the host. The parasite is normally positively heliotropic; the host is negatively so. To this the parasite has adapted itself by becoming negatively heliotropic after feeding."

Practical sanitation for apple orchards, M. D. Farrar, S. C. Chandler, H. W. Anderson, and V. W. Kelley (*Midwest Fruitman, 9 (1936), No. 10–11, pp. 3, 4, 8, 10*).—A practical contribution from the Illinois Experiment Station dealing particularly with codling moth control.

Epidemiological experiments with the paddy borer Schoenobius bipunctifer Walk.—I, *The influence of temperature and relative humidity on* oviposition and hatching, P. H. Tsai (*Agr. Sinica, 1 (1935), No. 9, pp. 273–317, figs. 19; Eng. abs., pp. 313, 314*).—This is a report of studies on *S. bipunctifer*, presented with a list of 45 references to the literature.

Studies on the rice-borer.—IV, V, On the prolonged emergence period of the moth in the spring (2, 3), C. Harukawa, R. Takato, and S. Kumashiro (*Ber. Ōhara Inst. Landw. Forsch., 7 (1936), No. 2, pp. 239–271*).—In continuation of studies of the Asiatic rice borer (E. S. R., 75, p. 231), the authors first report upon the results of an investigation of the effect of contact water on the time of initiation and on the velocity of development of the hibernating rice borers (E. S. R., 67, p. 435). It was found that in the northern part of Japan the majority of the larvae of the first generation of the rice borer overwinter. When a second generation is produced, the immature larvae die during hibernation. In experiments conducted in order to learn whether there is a difference in the time of emergence in the following spring according to the size of the larvae, and whether feeding in the period of hibernation affects the time of flight, no connection was found between the size of the larvae and the stage or degree of development which the larvae attained. The majority of the hibernating larvae of the larger size were females, and, conversely, the majority of the smaller larvae were males. The percentage of parasitized larvae was lower among the larger larvae, while it was markedly higher among the smaller larvae. The average time of flight was slightly earlier for moths from the smaller larvae than from the larger larvae.

Studies upon the problem of races of Anopheles quadrimaculatus Say in the United States, E. H. Hinman (*Amer. Jour. Trop. Med., 16 (1936), No. 3, pp. 303–309*).—Observations on the hibernation of the malaria mosquito *A. quadrimaculatus* in southern Louisiana are reported upon. The adult females were found to congregate in vast numbers in a deserted fort late in November, the majority remaining for a period exceeding 2 mo., followed by their dispersion. No distinguishing characters of the egg, larvae, or adults have been found, and it is concluded that this does not represent a separate subspecies.

A dustless method of diluting and spreading paris green in malaria control, M. A. Barber, J. B. Rice, and A. Mandekos (*Amer. Jour. Hyg., 24 (1936),*

No. 1, pp. 41–44).—A description is given of a method of spreading paris green without the use of dust. It consists in the use of a mixture of paris green and kerosene, the latter not serving as a larvicide per se but as a vehicle for spreading the paris green and keeping it afloat. The mixture may be diluted with water and spread by means of a horticulturists' sprayer, or placed undiluted on pebbles or other convenient projectiles and thrown widely over the mosquito breeding place. The choice of method of spreading the mixture will depend on the character of the breeding place and on other conditions.

The mosquitoes of Puerto Rico and their relation to human welfare, G. C. TULLOCH (*Puerto Rico Sta. Agr. Notes No. 72 (1936), pp. 7, pl. 1*).—This is a general account of the life histories and habits of the Puerto Rican mosquitoes most important as carriers of disease and as pests of human beings, with directions as to their control, based upon studies conducted by the author in Puerto Rico from July 1935 to June 1936. Of the more than 35 species occurring on the island, 3, here considered, are of particular importance, namely, the so-called tropical house mosquito (*Culex quinquefasciatus*), which carries filariasis; the yellow-fever mosquito; and the malaria mosquito *Anopheles albimanus*.

Horseflies of Arkansas, H. H. SCHWARDT (*Arkansas Sta. Bul. 332 (1936), pp. 66, figs. 21*).—Following a discussion of the losses caused by horseflies, the distribution of economic species in Arkansas, and rearing methods, life history studies of 22 species (including *Goniops chrysocoma* O. S., 7 species of the genus *Chrysops*, and 14 species of the genus *Tabanus*) are reported upon. There is also a discussion of control of the horseflies, a list of the 47 species known to occur in the State, and a list of 38 references to the literature.

The so-called little greenheads (*T. costalis* Wied. and the striped horsefly) are said to cause the most injury to livestock in the State, having constituted 60 percent of all collections. Other species that are of considerable economic importance are the black horsefly, *T. sulcifrons* Macq., *C. parvula* Daecke, *C. niger* Macq., and *T. pumilus* Macq.

The studies have shown the striped horsefly to produce at least two generations a year and that the black horsefly is capable of producing two generations. *T. stygius* Say usually, and the black horsefly rarely, required 2 yr. for the cycle from egg to adult. Occasional individuals of *T. stygius* develop in 1 yr. *T. costalis*, *T. benedictus* Whit., *T. lasiophthalmus* Macq., *T. sulcifrons*, and *T. trimaculatus* P. de B. each require approximately a year for development from egg to adult and exhibit no great variations in rate of growth.

"The larval habitat for most of the species studied is the mud bordering ponds or sluggish watercourses. The larvae of only two species have been consistently found elsewhere. All larvae of *T. annulatus* collected were found in decaying portions of either standing or fallen oak trees. Larvae of *G. chrysocoma* were nearly always found under a thick mat of dead leaves, and either at the surface or in the first inch of soil.

"The destruction of oviposition sites gives some promise as a control measure for several species of horseflies. Ponds with no plants or debris projecting from the water or occurring within 10 ft. of the water usually are not infested with larvae."

Some specific taxonomic characters of common Lucilia larvae—Calliphorinae—Diptera, E. F. KNIPLING (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 275–293, figs. 22*).—A description is given of certain taxonomic characters, including the three larval instars, of each of six species of *Lucilia* commonly found in the United States, namely, *L. illustris*, *L. sericata*, *L. cuprina*, *L. mexicana*, *L. silvarum*, and *L. caeruleiviridis*. A key for identification of the third-instar larvae is included.

Mediterranean fruit fly (*Hadar, 9 (1936), No. 1, pp. 20, 21*).—Reference is made to the Mediterranean fruitfly in Palestine, where, commencing with 1934, it became a serious pest of citrus fruit in certain settlements in the Jordan Valley and in Jericho, and was a source of damage in the coastal plain area from Ghuzzeh (Gaza) to Acre.

The effect of temperature on oviposition in Drosophila melanogaster, N. Kaliss and M. A. Graubard (*Biol. Bul., 70 (1936), No. 3, pp. 385–391, figs. 3*).—The authors found that for any given temperature of egg laying by the pomace fly there are no significant differences in rate of oviposition between females that have been bred at that temperature and those that have been bred at 25° C. The rate of egg laying (as measured by the number of eggs laid per day) starts low, rises to a maximum, and decreases. The rate for the middle period of egg laying is practically constant. The rate of egg laying is related to temperature according to the Arrhenius equation.

Contribution to the morphology and biology of Phytomyza atricornis Meig. [trans. title], A. Melis (*Redia, 21 (1935), pp. 205–262, pls. 3, figs. 19*).—The first part of the contribution deals with the morphology of this agromyzid pea leaf miner (pp. 206–233), and part 2 with its biology (pp. 234–261). A list is given of 15 references to the literature.

The chrysanthemum leaf miner and its control, H. W. Miles and M. Cohen (*Jour. Min. Agr. [Gt. Brit.], 43 (1936), No. 3, pp. 256–261, pls. 2, fig. 1*).—*Phytomyza atricornis* Meig. has caused serious damage to chrysanthemums and cinerarias, the attack in 1935 having been particularly severe in several counties of England. Experimental control work led to the recommendation that spray applications of nicotine be made at intervals of not longer than 10 days. Nicotine dust and sulfur dust applied every 10 days have been found valuable for checking the insect where frequent spraying is not convenient.

A note on Anthomyidae (Diptera) reared from the flowers of Senecio, J. E. Collin (*Ent. Rec. and Jour. Variation, 48 (1936), No. 5, pp. 53, 54*).—Reference is made to the rearing of *Pegohylemyia jacobaeae* Hardy from *Senecio jacobaea*.

Relative toxicity of certain stomach poisons to Phyllophaga lanceolata (Say) (Coleoptera—Scarabaeidae), B. V. Travis (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 235–241, fig. 1*).—In work at the Iowa Experiment Station "adult female June beetles, *P. lanceolata*, were administered various dosages of paris green, cuprous cyanide, arsenious oxide, acid lead arsenate, calcium arsenate, zinc arsenite, and sodium fluosilicate. Males were not used in these tests. The estimated median lethal dose for paris green was 0.03 mg/g of body weight, cuprous cyanide 0.04 mg/g, arsenious oxide 0.06 mg/g, and acid lead arsenate 0.12 mg/g. Calcium arsenate from this sample evidently produced very little toxic effect. Sodium fluosilicate seems to be of low toxicity. The zinc arsenite apparently has a relatively high toxic value for this insect. No m. l. d. was obtained for the three latter compounds. Beetles died even though they regurgitated freely after feeding upon the poison. Acid lead arsenate seemed to stimulate oviposition."

The toxicity of certain stomach poisons to the June beetle, Phyllophaga implicita (Horn), F. Andre and P. E. Pratt (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 243–248*).—In a study at the Iowa Experiment Station adults of the June beetle, *P. implicita*, were used as experimental insects in an effort to determine the minimum lethal dose values of eight stomach poisons. "Values were successfully found for five of the compounds tried, namely, paris green, acid lead arsenate, cuprous cyanide, sodium fluosilicate, and sodium fluoride. A wide variation was noted between the amounts of poison required

to kill males and females of this beetle. It was found necessary, therefore, to determine an m. l. d. value of each poison for each sex. Males in every instance were killed more readily than females. Paris green proved to be the most toxic to females in milligram/gram of body weight, whereas paris green and cuprous cyanide were equally toxic to males. On the other hand, sodium fluosilicate proved to be least toxic to both females and males as determined on the basis of milligram/gram of body weight. Females ate the poisons a little more readily than the males in every instance. The five insecticides can be arranged in the following order from the standpoint of getting the beetles to eat them most readily: Sodium fluosilicate, sodium fluoride, acid lead arsenate, cuprous cyanide, and paris green."

The bionomics of the ladybeetles, W. V. Balduf (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, p. 248*).—A brief abstract of a contribution by the author, with particular reference to *Chilocorus similis*, the convergent ladybeetle, and *Ceratomegilla fuscilabris*.

Derris as a Japanese beetle repellent and insecticide, W. E. Fleming and F. E. Baker (*Jour. Agr. Res. [U. S.], 53 (1936), No. 3, pp. 197–207*).—In a study of derris and its components, conducted under artificially controlled conditions, rotenone was shown to be 2.3 times as effective in combating the Japanese beetle as neutral potassium oleate as a contact insecticide, deguelin was equally as effective as the soap, and derris 0.387 times as effective. A small quantity of soap added to derris increased its effectiveness. Derris and its components, with the possible exception of rotenone, which appears to be equal to acid lead arsenate, were of little value as stomach poison insecticides. Derris is definitely repellent to the beetle, this action being attributed to the rotenone and deguelin content. Toxicarol, tephrosin, and derris resin had little deterrent effect on the insect. Exposure to ultraviolet light reduced the value of rotenone as a stomach poison, but the repellent effect was not destroyed as rapidly as the toxicity. It is pointed out that derris is readily washed from foliage by water, and this loss by the action of rain, and possibly by dew, is one of the most important factors limiting the effectiveness of derris sprays for control of the beetle. Several stickers were tested, none of which proved satisfactory.

A list is given of 19 references to the literature.

Paris green and its homologues as insecticides against the Japanese beetle, W. E. Fleming and F. E. Baker (*Jour. Agr. Res. [U. S.], 53 (1936), No. 3, pp. 187–195, fig. 1*).—A study of the effectiveness of paris green and its homologues as stomach poison insecticides against the adult Japanese beetle was conducted under controlled conditions of temperature, relative humidity, and light.

Acid lead arsenate was significantly more effective than paris green or its homologues. No correlation was found between total or water-soluble arsenious oxide content and the effectiveness of the materials. As some injury to foliage was caused by paris green and its homologues at lower concentrations than those that deterred the beetles from feeding, it is believed that these materials cannot be safely applied in their present form to control the beetle in the field.

The Colorado potato beetle (Leptinotarsa decemlineata Say) in North America [trans. title], **B. Trouvelot** (*Ann. Épiphyt. et Phytogénét., n. ser., 1 (1934–35), pp. 277–336, figs. 10*).—Following a brief introduction, this contribution takes up the history of the Colorado potato beetle prior to its becoming of importance as an enemy of the potato (pp. 279–289), its spread in North America from 1860 to the present time (pp. 289–293), biology and ecology (pp. 293–

314), economic importance (pp. 314–316), and control measures employed (pp. 317–329). The contribution is accompanied by a four-page list of references to the literature.

Experiments on some factors affecting fertility in Trogoderma versicolor Creutz. (Coleoptera, Dermestidae), M. J. Norris (Mrs. O. W. Richards) (*Jour. Anim. Ecol., 5 (1936), No. 1, pp. 19–22*).—The author finds that the biology of the stored products beetle *T. versicolor* is quite comparable with that of the Mediterranean flour moth, it being equally well adapted to living indoors.

Study on Chinese eumolpid beetles, S. H. Chen (*Sinensia, 6 (1935), No. 3, pp. 221–387, figs. 42*).—This report of studies of beetles of the chrysomelid subfamily Eumolpinae includes descriptions of a number of new species. A key to the 32 genera is included.

Notes on Cryptolestes ferrugineus Steph., a cucujid occurring in the Trichogramma minutum parasite laboratory of Colorado State College, E. H. Sheppard (*Colorado Sta. Tech. Bul. 17 (1936), pp. 20*).—A report is made of a study of the cucujid beetle *C. ferrugineus*, which has been found by the author to be of importance through infesting incubators used for rearing the Angoumois grain moth in the production of the beneficial parasite *T. minutum*. Part 1 (pp. 4–17) takes up its biology and part 2 (pp. 17, 18) the relation of the beetle to *T. minutum* parasite work.

Both the larvae and the adult beetles feed readily on the eggs of this moth. The eggs were found to hatch in from 4 to 6 days at a temperature of 83° C. and a high relative humidity. The larval period requires from 20 to 45 days or more, depending to a great extent upon the larval food. The larva molts four times, the last molt revealing the pupae. The food of the larva has been found to have a pronounced effect upon the length of the larval period. Larvae without food die within less than 24 hr. after emergence. They feed upon a wide variety of grains and animal foods, and are cannibalistic in that they feed upon both their own eggs and their own pupa. The pupal period requires from 4 to 6 days at a temperature of 83°. A preoviposition period of 10 days was observed in one case and a period of 15 days in another.

"The feeding habits of the adults are much the same as those of the larvae. The number of eggs deposited by the females is to a great extent dependent upon the type of food available. The length of the complete life cycle was found to vary from 28 to 53 days at a temperature of 83°. It has been found that a high relative humidity is essential to oviposition, hatching of the egg, larval development, and pupation.

"Natural enemies observed are the gamasid mite *Seiulus pomi* Parst., a hymenopteran (*Cephalonomia waterstoni* Gahan), and the cadelle beetle.

"Conditions in the Angoumois grain moth incubators are ideal for the development of the beetle. Eggs of the Angoumois grain moth as food produced the fastest larval development of the beetle and the highest oviposition record."

The morphology of the elm bark beetle Hylurgopinus rufipes (Eichhoff), B. J. Kaston (*Connecticut [New Haven] Sta. Bul. 387 (1936), pp. 609–650, figs. 14*).—Following an introduction and a discussion of the history and distribution and the systematic position and synonymy, detailed technical descriptions are given of the adult, pupa, larva, and egg of *H. rufipes*. A list of 52 references to the literature is included.

The effectiveness of partial bark peeling in the control of Ips, E. M. Hornibrook (*Jour. Forestry, 34 (1936), No. 6, pp. 620–622*).—An experiment in the Fort Valley Experimental Forest near Flagstaff, Ariz. (altitude 7,360 ft.), commenced June 1, 1935, at which time new generations of *Ips integer* (Eichh.) and of *I. oregoni* (Eichh.) were emerging on an adjacent area of

older cutting, is reported. Four groups of five logs each of ponderosa pine from which the bark was partially peeled, leaving bark strips 2, 3, 4, and 5 in., respectively, and a control of five logs from which no bark was removed were compared. The results are summarized in table form. Those obtained from the 2-in. bark strips were striking in that there were no adults, 10 of the 15 attacks having been abandoned after galleries from 2 to 4 in. in length had been constructed. The galleries from the other 5 attacks were from 6 to 9 in. long, which is shorter than usual, and in each case the larvae dried up and died before attaining the pupal stage. Although there is a difference of only one in the number of attacks between the 3- and 4-in. bark strips, the total number of new adults developed in the 4-in. strips was slightly more than 2.5 times that in the 3-in. strips. It is seen that as the width of bark strip increases, the number of new adults increases rapidly.

Watching for the plum curculio, W. J. SCHOENE (*Va. Fruit, 24 (1936), No. 6, pp. 26, 27*).—Reference is made to the gathering and destruction of peach droppings by growers in May, 50 to 90 percent of which in some orchards were found infested with the plum curculio. The first beetles were discovered in orchards on April 24, and as high as 40 and 50 beetles per tree were collected during the first 2 days in May. They continued to arrive in small numbers until May 25. The importance of destruction of summer brood beetles is emphasized.

Pollen analytic investigations on the relation between honey bees (Apis mellifica L. and A. mellifica var. ligustica Spinola) and red clover (Trifolium pratense L.), C. STAPEL and K. M. ERIKSEN (*Tidsskr. Planteavl., 41 (1936), No. 3, pp. 487–529, figs. 4; Eng. abs., pp. 527, 528*).—The pollen taken from bees collected at hive entrances both in eastern and western Sjaelland (Zealand) was shown to have been obtained from 40 species of plants. Of all the bees observed, 68 percent sought seed crops in the fields (*T. pratense, T. repens,* and *Daucus carota*), 22 percent weeds in the fields (*Centaurea cyanus, Papaver,* and *Cirsium arvense*), and only 10 percent plants in gardens or forests or wild plants on roadsides, hedges, etc. In the four localities observed, red clover was visited by 24.6, 24.5, 18.0, and 24.9 percent of the bees. Of the bees from 15 *A. mellifica ligustica* hives (the Italian bee) 33.4 percent visited red clover, while this plant was visited by only 12.6 percent of the bees from 16 *A. mellifica* hives (the Danish bee).

A longer tongue by the *A. mellifica ligustica* bee seems to cause the greater visit in red clover. The average length of tongues (mentum+glossa) from 8 *A. mellifica ligustica* hives was 5.911 mm, while from 8 *A. mellifica* hives the corresponding figure was 5.685 mm. The tongue of none of the *A. mellifica* bees reached a length of 6 mm, while this length was reached in 33.7 percent of the *A. mellifica ligustica* bees. It is considered probable that these long-tongued bees visit the red clover.

On the supposition that *A. mellifica* rape more frequently than *A. mellifica ligustica* bees, it is calculated that 1 hive of *A. mellifica ligustica* makes good for 4 hives of *A. mellifica*. In order to secure a good pollination, 2 to 3 hives with *A. mellifica ligustica* or 8 to 12 with *A. mellifica* bees are to be used at 1 ha (2.5 acres) of red clover.

The use of bees in the pollination of fruit, M. L. BOBB (*Va. Fruit, 24 (1936), No. 4, pp. 22, 23*).—A practical contribution on the use of bees in the orchard.

Diagnosing bee diseases in the apiary, C. E. BURNSIDE and A. P. STURTEVANT (*U. S. Dept. Agr. Circ. 392 (1936), pp. 35, figs. 21*).—In this contribution the symptoms of the diseases of the brood and of adult bees and their characteristics as observed in the apiary are described and illustrated.

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Dysentery in honeybees, E. C. Alfonsus (*Gleanings Bee Cult., 64 (1936), No. 5, pp. 275–279, figs. 3*).—A practical contribution from the Wisconsin Experiment Station.

The nesting habits of solitary bees: A comparative study, S. I. Malyshev (*Eos [Madrid], 11 (1936), No. 3, pp. 201–309, pls. 13*).—This treatise presents the general part of special studies on the ethology of various solitary bees.

The black wheat-stem sawfly, J. S. Houser (*Ohio Sta. Bimo. Bul. 182 (1936), pp. 109–111, figs. 2*).—The status of the black wheat-stem sawfly [*Trachelus tabidus* (Fab.)], first discovered in Ohio in 1934 (E. S. R., 72, p. 233) and reported upon in 1935 (E. S. R., 74, p. 229), is here dealt with, a map being given which shows current infestation in the State. The area of occupancy was extended somewhat during the year and the intensity of the infestation increased considerably in those areas where the damage was greatest during the preceding two seasons. The increase in intensity of infestation appears to be westward rather than northward. Having survived the extreme cold of the winter of 1935–36, the pest appears to be able to withstand almost any type of climatic conditions likely to occur in the State. The observations of the year confirm those of the preceding year with respect to the advisability of harvesting wheat infested with sawfly at as early a date as possible.

The European spruce sawfly outbreak in 1935, R. E. Balch (*Forestry Chron., 12 (1936), No. 2, pp. 144–151, fig. 1*).—This report has been noted from another source (E. S. R., 75, p. 387).

An Illinois marsh willow sawfly (Amauronematus lineatus) (Hymen., Tenthredinidae), H. H. Ross (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 261, 262, figs. 9*).—This contribution relates to a sawfly found feeding on willows growing in small marsh and temporary pond situations and commonly met with in the northern two-thirds of Illinois.

A contribution to our knowledge of the biology of certain sawflies of the genus Empria Lep. (Hymenoptera: Symphyta), H. W. Miles (*Jour. Linn. Soc. London, Zool., 39 (1936), No. 267, pp. 465–478, pl. 1, figs. 2*).—In studies of the biology of *E. abdominalis* F. and *E. tridens* Kon., the former was found to be a multivoltine species with thelytokous parthenogenesis and *E. tridens* a univoltine species with arrhenotokous parthenogenesis. *E. abdominalis* is associated with *Anagallis* and *Lysimachia* and lays large, conspicuous eggs in the under sides of the leaves. *E. tridens* feeds on *Rubus* spp. and inserts small inconspicuous eggs into the stems, leaves, and bud scales of the host plant. In *E. tridens* hibernation and pupation take place within the bark, dead wood, and pithy stems, while in *E. abdominalis* pupation takes place in the soil.

The black widow spider, F. E. D'Amour, F. E. Becker, and W. Van Riper (*Quart. Rev. Biol., 11 (1936), No. 2, pp. 123–160, figs. 7*).—The first part of this contribution describes the appearance of *Latrodectus mactans* and reports observations of its biology. Studies of the toxicity of its venom, its chemistry, immunology, toxicology, and pathology are then reported. Chemical studies indicate that the toxic principle is a protein, probably an albumin. Various antidotes were tested with negative results. The preparation of a potent antivenin in the rat is described, and a preliminary report on similar results in sheep is presented. The venom is shown to be chemically and serologically distinct from the poisonous principle of the eggs.

Household invasion by Rhipicephalus sanguineus and Teutana triangulosa: An ixodiphagous role of the spider [trans. title], J. Sautet (*Ann. Parasitol. Humaine et Compar., 14 (1936), No. 2, pp. 126–129, fig. 1*).—The invasion of a house by the brown dog tick in Corse (Corsica) was followed by its attack by a spider, *T. triangulosa*. Experimentally this habitually polyphagous spider was found to show a marked preference for ticks.

Life-history and morphology of Babesia canis in the dog-tick Rhipicephalus sanguineus, I, II, H. E. SHORTT (*Indian Jour. Med. Res., 23 (1936), No. 4, pp. 885–920, pls. 9, figs. 2*).—A description given of the forms of *B. canis* observed at the different stages of its life history in the brown dog tick is followed by a consecutive description of its life history from the time the parasite is ingested by the tick up to its transmission during the feeding of the latter to a fresh host. The morphology of the different stages is described.

The white mold mite on tomato, Eriophyes cladophthirus Nalepa, C. R. NEISWANDER (*Ohio Sta. Bimo. Bul. 182 (1936), pp. 114–116, figs. 2*).—This is an account of a mite that first appeared in several greenhouses in the Cleveland area of Ohio in the fall of 1933 and caused an organic disturbance of the tomato resembling a white mold. The white discoloration was caused by an abnormally heavy growth of plant hairs that appeared on the stem, on the foliage, and to a less extent on the fruit. Although reported by Rolfs in 1907 (E. S. R., 19, p. 852) as attacking tomatoes in Florida as early as 1892, this is said to be the first record of its injury to a greenhouse crop in the United States. The mite has appeared in the Cleveland area every year in the last four, but the damage was severe in only one greenhouse in 1934, when 30 percent of the crop was damaged. Practically every plant in the 2.5-acre house had the characteristic gray color and myriads of mites were present on all plants examined, but the injury has never been so severe as to kill the plants. The most hopeful control measure consists in the destruction of the infestation between crops.

The occurrence of the mite on bittersweet in Europe suggests the possibility that the same plant may be the source of the infestation in this country, although there is no record of such infestation in the United States.

Notes on the life history and the habits of Succinea horticola Reinhardt, the pest of greenhouse plants and grasses, Y. OKADA (*Jour. Imp. Agr. Expt. Sta., Nisigahara-Mati, Tokyo, Japan, 2 (1935), No. 4, pp. 499–508, pl. 1; Eng. abs., p. 508*).—Observations of the life history and habits of the mollusk *S. horticola* made at the Imperial Agricultural Experiment Station at Tokyo are reported. This small species is very injurious to the young leaves of *Eudendron*, lily roots, and other plants found in a greenhouse in Yokohama.

ANIMAL PRODUCTION

[Investigations with livestock in Nevada] (*Nevada Sta. Rpt. 1935, pp. 17, 18, 25–30, 36, figs. 2*).—Results obtained in studies with livestock are reported on the development of a rotation paddock system of grazing on irrigated sheep pastures, by C. E. Fleming and C. A. Brennen; the value of skim milk in the ration of pigs on pasture, by F. B. Headley; the effect of varying amounts of protein in turkey rations on rapidity of growth, economy of gain, and malformations of the bones, by Headley; and investigations with dairy cattle in Nevada, by Headley, which yielded information on the economic efficiency of alfalfa hay as a sole ration for dairy cattle and on factors influencing the profitableness of grain feeeding.

The use of rabbits in determining the palatability or toxicity of forage, G. E. RITCHEY (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 484–486*).—In a study at the Florida Experiment Station the author was led to conclude that rabbits could be safely used in determining the palatability of newly introduced plants of which little or nothing is known. It is pointed out, however, that the rabbit must be considered only as indicative of what may be expected, and that the final decision should be based on tests with cattle.

Mineral content of Manitoba hays, J. H. ELLIS and O. G. CALDWELL (*Sci. Agr., 16 (1936), No. 10, pp. 521–537*).—The observation that cattle in certain

sections of Manitoba suffered malnutrition or mineral deficiency of a similar nature to that caused by the low phosphorus content of hay and pasture in other countries led to this investigation.

Analyses of a large number of hay samples representing many varieties from widely distributed areas showed a marked variation in mineral content, particularly phosphorus, the extremes ranging from 0.15 percent of phosphoric acid in timothy grown on unfertilized peat soil to 0.497 percent of phosphoric acid in meadow fescue grown on fertilized soil. All native lowland grass hays and many of the cultivated grass hays were classified as low or tending toward a low order in phosphoric acid content, and cattle wintered exclusively on such hay could not consume sufficient quantities to maintain a favorable phosphorus balance. Alfalfa was higher in calcium oxide but no higher in phosphoric acid than the average of the grass hays. Late cutting and improper curing methods each resulted in a lowered phosphoric acid content. Adding phosphate fertilizers to soils low in available phosphorus materially increased the phosphate content of the hay produced, but little effect was noted for such treatment on naturally productive soils.

Effect of different methods of wintering beef calves, in the northern Great Plains, on winter gains and feed costs and on subsequent summer gains, W. H. Black, J. R. Quesenberry, and A. L. Baker (*U. S. Dept. Agr., Tech. Bul. 529 (1936), pp. 11, fig. 1*).—This experiment was conducted in cooperation with the Montana Experiment Station at the U. S. Range Livestock Experiment Station, during three consecutive winters with beef calves weaned in October and grazed on alfalfa aftermath until winter feeding was started. Three groups of calves were carried each winter and were wintered on rations of alfalfa hay alone, alfalfa and cottonseed cake, and alfalfa and corn silage, respectively.

On the average, winter feeding started December 13 and terminated April 13, a 121-day period, while the succeeding summer grazing period averaged 195 days. Based on alfalfa hay at $10.82 per ton, cottonseed cake at $48.34 per ton, and corn silage at $5 per ton, the average winter feeding cost per calf was $8.58, $10.22, and $8.95 for the three rations, respectively, while the average gain for the combined winter and summer periods was 325, 332, and 343 lb. and the average feed cost per 100 lb. of gain was $3.24, $3.67, and $3.18, respectively. It is concluded that good quality alfalfa hay when fed alone is a satisfactory winter feed for beef calves which are to be turned on native range early in April, the cost of wintering on such a ration is less than when high-priced supplements are fed, and the results attained are generally more economical. The use of corn silage with alfalfa hay produced greater winter gains, the calves going on spring range in much higher condition, and it may be recommended where corn silage can be produced economically.

Beef cattle feeding investigations: 172-day experiment comparing rations for feeding steer calves, W. L. Blizzard (*Cattleman, 23 (1936), No. 1, p. 23*).—The Oklahoma Experiment Station has conducted feeding trials with eight lots of steer calves to determine the comparative value of prairie hay, alfalfa hay, cottonseed hulls, and kafir silage, four lots receiving a full grain feed and the remaining lots fed at such a rate as to gain approximately 1.5 lb. per head daily. Prairie hay and alfalfa produced more economical gains than hulls or silage, with the silage proving least efficient for the full-fed group and hulls for the limited-fed group. In all cases the limited-fed group showed a lower feed cost per 100 lb. of gain than the full-fed group.

The influence of type and age in fattening cattle, G. A. Branaman and G. A. Brown (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 16–21*).—One lot each of white-faced beef-bred calves, grade Holstein calves, and grade Holstein

yearlings was fed on a fattening ration of corn, cottonseed meal, corn silage, and alfalfa hay for a 6-mo. period. The economy of gain was similar for the two calf groups, although the white-faced calves gained somewhat more rapidly. The yearlings made more rapid but much less economical gains than the calf groups, particularly during the latter half of the period. The Holstein carcasses were all graded as medium, while the white-faced lot graded good to choice. Making deductions for feed costs and interest from the sale value of the steers on the basis of 1936 prices, the feed lot value of the feeder cattle was $10.07 for the white-faced calves, $7.62 for the Holstein calves, and $5.90 for the Holstein yearlings.

Investigations on producing quality in beef, J. Hammond and W. S. Mansfield (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1936*), *No. 10, pp. 977–985, pls. 4, figs. 2*).—Four lots of Irish-bred Shorthorn heifers were mated to beef bulls of either the Hereford, Shorthorn, Aberdeen-Angus, or Sussex breeds. All calves were weaned at 30 weeks of age and subsequently fed in dry lot for 38 weeks, being marketed at about 16 mo. of age.

Dressing percentages varied from 57.6 to 64.3 percent, with an average of 61 percent, and all carcasses graded as select. No pronounced differences were noted in quality of the offspring of the different breeds of bulls used.

Alfalfa meal in the ration of pigs [trans. title], F. Svoboda (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Československ.* (*Rec. Trav. Insts. Rech. Agron. Répub. Tchécoslov.*), *145* (*1936*), *pp. 35+*[*1*], *pls. 3; Ger., Eng. abs., pp. 27–33*).—In a comparative feeding test with four lots of eight pigs each, replacing all animal protein in the ration with alfalfa meal markedly decreased the rate of gain and increased the feed cost per unit of gain, while a mixed protein supplement containing ⅛ kg of alfalfa meal per head daily plus animal protein produced practically as good gains as the no-alfalfa ration and at the same feed cost per unit of gain. No differences were detected in texture and flavor of the resulting meat.

Dried sugar-beet pulp for bacon pigs, E. T. Sykes (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1936*), *No. 10, pp. 992–998*).—In a series of six feeding trials, it is shown that from 20 to 25 percent of dried beet pulp may be substituted for either corn meal, barley meal, or "weatings" in the ration of fattening bacon pigs without adversely affecting the rate of gain, the feed required per pound of gain, or the carcass grade of the pigs.

The calcium and inorganic phosphorus content of the blood serum of swine, E. H. Hughes (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 4, pp. 267–279*).—This contribution from the California Experiment Station deals with the calcium and inorganic phosphorus content of the blood serum of swine of various ages on normal rations and on high and low levels of calcium intake. Under normal feeding serum calcium ranged from 14.4 mg per 100 cc of blood in pigs under 15 days of age to 11.4 mg in mature animals, with an average of 11.93 mg for pigs of all ages. Inorganic phosphorus ranged from 9.37 mg in very young pigs to 7.63 mg in yearling animals, with an average of 8.34 mg for all ages. Direct administration of calcium into the stomach caused a temporary rise in blood calcium, while continuous feeding at a high calcinm level caused a prolonged rise in serum calcium, such increase usually being accompanied by a decrease in the inorganic phosphorus. Continuous low calcium intake caused a marked decrease in serum calcium, generally accompanied by an increase in inorganic phosphorus, although in young pigs this also is decreased. Very low serum calcium eventually resulted in evidence of calcium tetany.

The effect of various levels of alfalfa meal upon the development of body organs of cockerels, F. R. Sampson and F. E. Mussehl (*Poultry Sci.*, *15* (*1936*), *No. 4, pp. 304–306*).—In a study at the Nebraska Experiment Station two lots of

50 White Rock cockerels each received rations of similar composition and digestible nutrient value but containing 5 percent and 20 percent of alfalfa meal, respectively. The two pens were carried on the experimental ration for 84 days, at which age all birds were killed and the organs removed, carefully dissected of all fat, and weighed or measured.

The only significant difference noted between the size of organs of the two lots was the greater length of small intestines of the lot receiving the high level of alfalfa meal. The possibility of using this principle in developing pullets with greater digestive capacity and also the possibility of such development resulting from a high crude fiber content in the ration rather than from the more complex contribution of alfalfa meal are suggested.

Continuous hopper feeding of corn and oats to laying pullets, J. A. Davidson (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 3–6*).—Two pens of 120 White Leghorn pullets each and two pens of 100 Rhode Island Reds each were fed for 11 mo., one pen of each breed receiving a 20.5 percent protein mash containing ground corn and the other a similar mash containing ground barley. Corn and oats were fed in individual hoppers similar to those used for the mash.

Hopper feeding of corn and oats gave satisfactory egg production, and under the conditions of this trial the pullets balanced their crude protein intake. This method of feeding eliminated irregularities in time of feeding and amounts fed, but artificial lights appeared necessary for its successful use. Mortality was similar to that obtained under usual feeding methods.

Sweet lupine meal as a protein feed for poultry: Its digestibility by hens [trans. title], E. Mangold and H. Stotz (*Arch. Geflügelk., 9 (1935), No. 2–3, pp. 64–77; Eng. abs., p. 76*).—Analyses of several varieties of yellow sweet lupine meal, including a new alkaloid-free variety, showed them to contain about 45.5 percent of crude protein, 4.6 percent of fat, and 29 percent of nitrogen-free extract on a dry matter basis, while blue lupine seed contained 34.2 percent of protein and 4.5 percent of fat. Digestion trials with hens showed digestibility coefficients for protein and fat for the yellow lupine meal were 88.6 and 79.5 percent and for the blue lupine 82.9 and 84.7 percent, respectively. Crude fiber and nitrogen-free extract were practically indigestible in each case.

Sweet lupine meal as a protein feed for poultry: Suitability for chicken rearing [trans. title], E. Mangold and H. Damköhler (*Arch. Geflügelk., 9 (1935), No. 8–9, pp. 233–255, figs. 9; Eng. abs., p. 254*).—In experiments with White Leghorn chickens it is shown that replacing from one-third to two-thirds of the usual fish meal and meat meal content of the ration with sweet lupine meal prepared from the seed of either the yellow or blue sweet lupine gave excellent results, producing normal growth and with the birds reaching maturity for egg production at the normal age. Evolution of the ovaries was normal, and no pathological conditions were encountered that could be attributed to the ration.

Potatoes for chickens, D. C. Kennard (*Ohio Sta. Bimo. Bul. 182 (1936), pp. 111–113*).—Results are presented to show that steamed or boiled potatoes may be substituted on a dry matter basis for a considerable proportion of the cereal grains in the ration of either laying or fattening chickens with satisfactory results. From 4.1 to 4.67 lb. of potatoes were required to replace 1 lb. of grain in the ration. Feeding raw potatoes to broilers was unsatisfactory.

Potato flakes and sugar beet shavings in rations for hens [trans. title], R. Fangauf and O. Brüninghaus (*Arch. Geflügelk., 9 (1935), No. 8–9, pp. 269–281; Eng. abs., p. 280*).—In this trial four groups of laying hens received rations containing potato flakes and sugar beet shavings in the following respective proportions: 15 and 15 percent, 39 and 9, 70 and 0, and 9 and 39 percent. Considering the first ration as normal, both feed consumption and egg production

on the 39-percent potato ration were above the normal. Feed consumption on the 39-percent sugar beet ration equaled the normal but was somewhat lower for the 70-percent potato ration, while egg production in both was considerably below the normal. There was little difference in cost of egg production for the various groups, and no detrimental effects on weight, yolk color, or hatchability of eggs were noted.

Milk in the rearing of chickens [trans. title], R. FANGAUF and A. HAENFEL (*Arch. Geflügelk., 9 (1935), No. 2–3, pp. 33–65, figs. 5; Eng. abs., pp. 62, 63*).—Chickens from the same hatch were divided into two groups and reared under identical conditions, except that one group received water to drink while the other group received sour skim milk. Both dry feed and liquid consumption were very similar for the two groups, amounting to approximately 6.25 kg of feed and 8 l of liquid per bird to 20 weeks of age. The milk-fed chicks made more rapid gains during the first 8 weeks, and averaged 13 percent higher than the water-fed lot at 20 weeks of age. Feed costs per bird were slightly higher for the milk-fed group, but cost per unit of gain was practically equal. It is suggested that chicks should have free access to skim milk to 8 weeks of age, after which time it should be rationed to them in lesser amounts.

How much skim milk is required to replace the normal allowance of fish meal in a laying ration? [trans. title], R. FANGAUF, O. BRÜNINGHAUS, and A. HAENFEL (*Arch. Geflügelk., 9 (1935), No. 7, pp. 201–212; Eng. abs., p. 212*).—Four lots of White Leghorn pullets each handled alike and receiving the same grain ration and basal mash were given a protein supplement of 12 g of fish meal or 175, 145, or 115 g of skim milk daily per bird, respectively.

All milk-fed lots, in spite of the lower protein intake, produced as many as or more eggs than the fish-meal lot. The minimum protein requirement was not established, since 115 g of skim milk proved ample in this trial. The two lots receiving the smaller quantities of milk returned the greater profit over feed cost, although the total feed cost per lot was similar, the total mash consumption increasing as the amount of milk was reduced. No pronounced difference in body weight or in fertility and hatchability of the eggs was noted among the different groups.

Mineral-acid silage as a poultry feed [trans. title], A. TSCHERNIAK (*Arch. Geflügelk., 9 (1935), No. 8–9, pp. 255–269; Eng. abs., p. 268*).—In a comparative feeding trial extending over a 12-week period, two lots (24 each) of Rhode Island Red hens were fed a basal diet of 50 g of wheat per hen daily plus free access to a laying mixture. In addition one group had access to mineral-acid clover grass silage (A. I. V. process). The silage group consumed an average of 46.8 g of silage daily but 20 percent less of the laying mixture and produced 14 percent more eggs than the no-silage group. The silage-fed group also showed a more efficient utilization of the nutrients consumed.

Results of feeding various levels of soil containing beryllium to chickens, dogs and rats, C. W. DUNCAN and E. J. MILLER (*Jour. Nutr., 11 (1936), No. 4, pp. 371–382; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, p. 58*).—The Michigan Experiment Station has investigated the possibility of the occurrence of a natural beryllium toxicosis as a result of animals ingesting soil containing this element. Analyses of the suspected soil showed a content of 0.223 percent of beryllium.

The inclusion of 30 percent of such soil in the ration of rats, 50 percent in chick rations, and 60 percent in the ration of dogs failed to interfere with normal growth or to produce any rachitic symptoms or other evidence of toxicity, thus failing to confirm reports that the ingestion of soil in certain areas of northern Michigan caused malnutrition or deformity in animals.

Protection afforded by certain vegetable oils against nutritional encephalomalacia of chicks, A. M. Pappenheimer and M. Goettsch (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 777–779*).—Continuing this line of investigation (E. S. R., 69, p. 719) in an attempt to find materials offering protection against nutritional encephalomalacia, the authors, with the assistance of A. Alexieff, have shown that when certain vegetable oils were substituted for lard in the basal diet (No. 108) all chicks were completely protected from the disease. Cottonseed oil, hydrogenated cottonseed oil, corn oil, and peanut oil, each afforded complete protection, while olive oil was less efficacious.

The prevention of nutritional encephalomalacia in chicks by vegetable oils and their fractions, M. Goettsch and A. M. Pappenheimer (*Jour. Biol. Chem., 114 (1936), No. 3, pp. 673–687*).—In continuation of the above studies, this investigation, in which the authors had the assistance of A. Hart, demonstrated the presence of the antiencephalomalacia factor in the nonsaponifiable fraction of certain vegetable oils. When the diet (No. 108) upon which the disease was first observed was supplemented with 5 percent of soybean oil, which replaced an equal amount of lard, the incidence of the disease was 1.6 percent, or one chick developed the disorder out of a total number of 62. This oil was, therefore, used for studies on properties and concentration of the factor.

The factor as present in soybean oil was found stable to autoclaving for 6 hr. at 120° [C.] and to irradiation from a quartz lamp for 30 min. at a distance of 3 ft. It was only partially soluble in 95 percent ethyl alcohol at room temperature. Continuous extraction with the alcohol for 2 weeks failed to remove any more of the active material. The factor in this extract was stable to aeration at room temperature for 48 hr. and to saponification at room temperature for 18 hr. in a nitrogen atmosphere. Saponification with exposure to air completely inactivated the extract.

Petroleum ether, purified by treatment with concentrated sulfuric acid for several weeks, followed by washing and distillation, was used to extract the nonsaponifiable and fatty acid fractions. The protective dose of the nonsaponifiable fraction was 0.24 g per kilogram of the diet. The fatty acid and water-soluble portions of the extract had no protective activity.

The discussion included in this paper related to the nonidentity of this factor to vitamin E, to the gizzard factor of Dam (E. S. R., 74, p. 682), and to the vitamin B_4 of Keenan et al. (E. S. R., 71, p. 364).

Brain weight and moisture content in normal chicks and those with nutritional encephalomalacia, M. Goettsch and A. M. Pappenheimer (*Amer. Jour. Physiol., 115 (1936), No. 3, pp. 610–617, figs. 3*).—In a comparison of the weight and moisture content of the brain of normal chicks and those with nutritional encephalomalacia by the authors, with the assistance of A. Hart, it is shown that normally the weight of the whole brain is not influenced by age, sex, or rate of growth of the chick, but is dependent only on the body weight. The percentage of water in different parts of the brain from 8 to 60 days of age was found to be constant and independent of the age of the chick or size of the brain. In chicks suffering from acute encephalomalacic lesions in either the cerebrum or cerebellum there was a distinct increase in both weight and moisture content of the affected region.

The protein requirements of laying hens, V. Heiman, J. S. Carver, and J. L. St. John (*Washington Sta. Bul. 331 (1936), pp. 16, fig. 1*).—In this experiment the 6 rations used contained from 12 to 13 percent of plant protein; 14, 15, 16, and 18 percent of plant and herring fish meal protein; and 16 percent

of plant, herring fish meal, and dried skim milk protein, respectively. Each was fed as an all-mash ration to triplicate pens of White Leghorn pullets over a 280-day experimental period.

The results clearly indicate that the 12 to 13 percent protein level from plant sources alone was inadequate in maintaining body weight for the duration of the experiment, and the total egg production and the size and hatchability of the eggs for this group was lower than for any of the groups receiving supplementary animal protein. The 14 percent protein ration was adjudged as about the minimum required for a 60 percent rate of production with eggs of satisfactory weight. Little difference was noted in regard to rate of production, and size, quality, and hatchability of the eggs at any of the higher rates of protein feeding. The substitution of 2.5 percent of dried skim milk for an equivalent amount of herring fish meal at the 16 percent protein level did not improve the effectiveness of the ration. Fish meal did not adversely affect egg quality in any case. It is concluded that 15 percent protein from adequate sources is sufficient in a laying ration. When mash and scratch grains are fed in equal parts 20 percent protein in the mash should prove adequate.

Effect of different sources of vitamin D on the laying bird, I, II (*Poultry Sci., 15 (1936), No. 4, pp. 326–344, fig. 1*).—These are reports of studies at the Ohio Experiment Station.

I. *Egg production, hatchability, and tissue composition*, R. M. Bethke, P. R. Record, C. H. Kick, and D. C. Kennard.—In the first study four lots of 30 White Leghorn hens each were used, each lot receiving the same all-mash ration. Lots 1 and 4 received no vitamin D supplement, lot 2 received 2 percent of cod-liver oil in the mash, while lot 3 received the same equivalent number of rat units as irradiated ergosterol. Lots 1, 2, and 3 were housed behind ordinary window glass, while lot 4 was housed behind Cel-O-Glass.

The average egg production per bird from December 1 to May 30 was 39.3, 86.8, 67.2, and 78.3, and the percentage mortality over the same period was 23.3, 10, 30, and 16.6 for the four lots, respectively. After 5 mo. on experiment the percentage of dry eggshell expressed as on the fresh weight of eggs was 5.25, 9.45, 7.96, and 9.27, and the percentage hatchability of fertile eggs was 0, 60.5, 47.6, and 62.5 for the respective lots. These results indicate that mortality, egg production, eggshell quality, and hatchability of eggs are greatly influenced by the amount of the antirachitic factor supplied.

Feeding adequate amounts of irradiated ergosterol or allowing access to direct sunlight after 6.5 mo. on a ration either low in or devoid of vitamin D materially improved production, shell quality, and hatchability of eggs. Irradiated ergosterol is not as efficient a source of vitamin D as cod-liver oil for laying hens, requiring approximately ten times as many rat units to give the same results. Fifty-four international rat units as cod-liver oil per 100 g of ration were insufficient for optimum results, while 5,400 units per 100 g of ration were excessive and decreased egg production and hatchability. Massive doses of 54,000 units of irradiated ergosterol per 100 g of ration were toxic, leading to anorexia, loss of weight, and lowered production, with evidence of decreased plasma phosphorus and calcification in the kidneys.

II. *Storage of vitamin D in the egg and chick and mineral composition of the mature embryo*, R. M. Bethke, P. R. Record, O. H. M. Wilder, and C. H. Kick.—Vitamin D assay of the egg yolks produced on the various rations as described in part 1 indicated that their antirachitic potency depends on the vitamin D intake of the bird producing it. Determination of the calcium and phosphorus content of the blood and ash content of the bones of day-old chicks indicated that vitamin D storage in chicks is also dependent (within limits)

on the vitamin intake of the parent. Vitamin A as irradiated ergosterol was less efficiently transferred to the egg than similar units from cod-liver oil, with evidence that the vitamin D occurring in the egg is in the same biological form as that fed to the hen.

The vitamin D requirements of growing chicks and laying hens, R. R. Murphy, J. E. Hunter, and H. C. Knandel (*Pennsylvania Sta. Bul. 334 (1936), pp. 38, figs. 10*).—This bulletin gives further consideration to the results previously published (E. S. R., 71, p. 521) and presents results of a second series of experiments of a similar nature. A cod-liver oil vitamin D concentrate (Zucker process) was used as the primary source of vitamin D in both series of experiments. Using the rat assay method (U. S. P. X. Revised 1934), the concentrate was found to contain 310 U. S. P. units of vitamin D per gram. This concentrate was added to the basal rachitic diet fed all groups of birds at such rates as to provide a vitamin D potency ranging from 0 to 310 units per 100 g of ration.

In general, the results of the second series of experiments confirmed the previous findings. Chicks on the basal diet without vitamin D supplement and confined without access to sunlight became rachitic at approximately 3.5 weeks of age. Nineteen units of vitamin D per 100 g of feed appeared to be the minimum protective level for chicks up to 24 weeks of age, a few individuals showing rachitic symptoms at this level although growth rate was normal. Thirty-nine units per 100 g of feed produced very satisfactory growth and bone development, while no advantages resulted from providing higher levels of vitamin D in the ration of the growing chicks.

In the experiments with laying pullets confined without access to sunlight 58 units per 100 g of the all-mash ration gave unsatisfactory results, while 78 units per 100 g of ration gave satisfactory results in maintenance of body weight, egg production, size of eggs, quality of shell, and hatchability. Under climatic conditions existing in this experiment spring-hatched chicks under range conditions secured sufficient sunshine irradiation for normal growth and bone development, and the laying pullets on range received sufficient irradiation for satisfactory performance during the entire laying period.

The albumen index as a physical measurement of observed egg quality, V. Heiman and J. S. Carver (*Poultry Sci., 15 (1936), No. 2, pp. 141–148, figs. 2; U. S. Egg and Poultry Mag., 42 (1936), No. 7, pp. 426, 427, 428, 429, fig. 1*).—This contribution from the Washington Experiment Station describes a method for measuring width and height of the thick white of eggs and presents tables for rapid calculation of the albumin index for given measurements.

Eggs were graded into one of five grades at the time measurements were taken. The correlation between grade and albumin index was found to be 0.932±0.002, and the mean index for the five grades was 0.124, 0.099, 0.069, 0.048, and 0.032, respectively. The suitability of this index in determining apparent egg quality is suggested.

The albumen index determination by nomogram, L. A. Wilhelm and V. Heiman (*U. S. Egg and Poultry Mag., 42 (1936), No. 7, pp. 426, 427, 428, 429, figs. 4*).—With further reference to the albumin index of eggs it was found that when egg weight was held constant there was a correlation of 0.986±0.001 between albumin index and the height of the albumin. This led the authors to study the possibility of deriving the albumin index from albumin height, using a proper correction for egg weight. Based on the weight, albumin height, and albumin index of 2,842 eggs representing a uniform distribution in the various classes, the authors have constructed a nomogram chart for the rapid determination of albumin index. A comparison of the estimated index with the calculated index shows very close agreement between the two methods.

The egg yolk surface in fresh eggs, P. J. Schaible, J. A. Davidson, and J. M. Moore (*Poultry Sci., 15 (1936), No. 4, pp. 298–303; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 58, 59*).—A spotting of yolks of fresh broken-out eggs frequently observed and caused by nonuniformity in the peripheral light yolk layer is noted. Its presence and degree of intensity varied in eggs from an individual hen from day to day. The authors were unable to show a relationship between its occurrence and rate of production, atmospheric temperature, time of day the egg was laid, the position of the egg in the cycle, or egg weight. Simulation of this condition by slight mechanical pressure on the yolk membrane of normal eggs led to the suggestion that such spotting may be due to imprints from imperfections in the follicle. Other types of spotting are mentioned, and the condition of the egg yolk surface in relation to candling of eggs is discussed.

Summary of feeding and confinement rearing experiment with turkeys during 1935, F. N. Barrett, C. G. Card, and A. Berridge (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 24–29, fig. 1*).—Poults hatched May 8 were divided at 1 week of age into 4 lots of 25 birds each and placed in an indoor pen until transferred to a large open turkey house at the end of the seventh week. Poults hatched June 28 were similarly treated except that they were removed to the open house at the end of the fifth week. The rations fed in the respective lots contained 23, 19, 24, and 26 percent of protein in the mash. Lots 1 and 4 received water only to drink, while lots 2 and 3 received skim milk only. The mash, whole corn, gravel, and drink were before the birds at all times, and chopped fresh alfalfa was fed daily.

The early-hatched poults were more efficient in the amount of feed required to produce 1 lb. of gain and in cost per unit of gain than the late-hatched poults. The latter birds consumed a greater proportion of corn to mash in all lots. Poults receiving liquid skim milk consumed less mash per pound of gain but ate more corn than poults receiving water to drink. At the prices of feed charged the cost per pound of gain was approximately 2 ct. less for the lots receiving liquid milk. Feeding milk, however, had the disadvantage of requiring more labor in caring for the milk and dishes and in attracting more flies with their possibility of tapeworm infestation. The cost of producing gains with any of the rations used was quite satisfactory. The method of rearing under confined conditions was found to be practicable with the rations used.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Vermont] (*Vermont Sta. Bul. 407 (1936), pp. 13, 14, 19–27*).—Data obtained in studies with dairy cattle are reported on calcium and phosphorus metabolism, the effect of feeding cod-liver oil concentrate to calves, digestibility of grass silage plus molasses, the feeding value of artificially dried hays, and the feeding value of grass silage v. corn silage.

In studies with dairy products, information was obtained on the canning of Cheddar cheese, milk and dairy products consumption in Burlington, the methylene blue reduction test of mastitic milk, sampling to determine the sterility of farm utensils, variable oxygen absorption in cold milk as a factor in the methylene blue reduction test, sediment and bacterial count of machine drawn milk and strippings, a modified medium and incubation temperatures as they affect bacteria counts of milk containing organisms arising from various sources of contamination, and treatment of milk previous to separation and the effect on the viscosity of market cream.

The quantities of grass that dairy cows will graze, T. E. Woodward (*Jour. Dairy Sci., 19 (1936), No. 6, pp. 347–357*).—The U. S. D. A. Bureau of Dairy Industry has conducted a total of 15 grazing trials extending over 2- to 4-day periods. The quantity of grass consumed by the cows was estimated by comparing the yield of clippings obtained from the grazed area immediately after the grazing trial with the clippings from a similar ungrazed check area.

The estimated consumption of green material and dry matter, respectively, for the different trials was as follows: In May 1932, Jerseys 151 lb. and 27.5 lb., Holsteins 149 and 30.4; June 1932, Jerseys 98 and 20.5, Holsteins 109 and 23.9; August 1932, Jerseys 47 and 14.7, Holsteins 50 and 16.9; April 1933, Jerseys 148 and 33.7, Holsteins 154 and 35.2; and July 1933, Holsteins 146 lb. and 34.1 lb.

Atmospheric temperature apparently had little effect on the rate of grazing. The quantity consumed by the two breeds showed only slight differences, the Jerseys consuming somewhat more per unit of live weight than the Holsteins. The estimated total digestible nutrients consumed under the most favorable conditions were sufficient to provide maintenance and support production of 40 lb. of milk and 1.8 lb. of fat daily by the Jerseys and 45 lb. of milk and 1.72 lb. of fat by the Holsteins. It is concluded that a cow is capable of grazing about 6 percent of the grass on an acre daily up to a maximum of 150 lb. of fresh grass or from 30 to 35 lb. of dry matter.

Recent knowledge applicable to the normalizing of feed rations for dairy cows [trans. title], F. Svoboda (*Sborn. Československ. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 10 (1935), No. 2, pp. 134–139; Eng. abs., p. 139*).—This article discusses proposed changes in feeding standards for dairy cattle with regard to both maintenance and production requirements and control of the dry matter content of the ration.

The nutritive value of proteins for maintenance, S. Morris and N. C. Wright (*Jour. Dairy Res. [London], 6 (1935), No. 3, pp. 289–302, figs. 4*).—The Hannah Dairy Research Institute has investigated the bovine maintenance requirement for cystine and lysine. The results indicate that the maintenance requirement of cattle for cystine is very minimal and possibly dispensable, and that cystine-deficient rations are unlikely to occur in general feeding practices. It is further shown that cattle have a definite lysine requirement for maintenance, which is tentatively calculated to be 0.8 g of lysine nitrogen daily per 1,000 lb. of live weight. The biological values of blood meal, maize germ meal, wheat gluten meal, and rye flour for cattle are presented.

The metabolism of betaine and allied tertiary nitrogenous bases in the ruminant, W. L. Davies (*Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 14–24, fig. 1*).—In this study it is shown that the primary excretory product resulting from ingestion of the tertiary nitrogenous bases by ruminants is trimethylamine oxide. The nitrogen of simple bases is rapidly and almost wholly excreted in this form, but with more complex compounds, as betaine, choline, etc., only from 14 to 43 percent of the nitrogen is so excreted, the amount varying with the level of intake, the form ingested, and the tolerance of the animal to the base fed.

The feeding of these bases in relatively small quantities, such as 100 g of betaine daily, results in a peak of excretion at from 4.5 to 6 hr. after ingestion. Since betaine is generally recognized as the precursor of fishy flavor in milk, a practical application is to feed any product containing appreciable quantities of betaine during or immediately following a milking period in order to allow a maximum interval between the time of feeding and the next milking period.

Feeding experiments on the effect of silage on yield and composition of milk and butter [trans. title], DIBBERN, SUDHOLT, RINTELEN, and SCHÄTZEL (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 33 (1935), No. 3, pp. 409–416*).—The results of two tests, each including three groups of cows, are presented. These groups received 0, 15, and 30 kg of silage per cow daily, respectively, with the protein and starch equivalent of the ration being equalized by adjusting the amount of roots and concentrates fed.

Silage feeding caused a slight increase in milk yield, while neither flavor, bacterial content, nor chemical composition of the milk was affected. The flavor and aroma of the butter were not altered, but the intensity of the color in the butter increased progressively as the rate of silage feeding increased. A slight lowering of the melting and solidifying points was the only physical change occurring in the fat due to silage in the ration.

The nutritive value of artificially dried grass and its effect on the quality of milk produced by cows of the main dairy breeds, S. J. WATSON and W. S. FERGUSON (*Jour. Agr. Sci. [England], 26 (1936), No. 2, pp. 189–211*).—In feeding trials at the Agricultural Research Station, Jealott's Hill, two groups of milking cows were alternated between a normal winter ration of roots, hay, and concentrates and a ration in which approximately 8 lb. of artificially dried grass per cow daily replaced part of the concentrates, the two rations being adjusted so as to supply equal quantities of protein and starch equivalents.

No significant differences were detected in the yield or in the butterfat and solids-not-fat content of the milk of the two rations. Cows on the dried-grass ration showed greater live weight increases and a marked increase in the yellow color of milk resulting from the greater carotene intake in the dried grass. The composition and digestibility of the dried grass are indicated.

Feeding butterfat to dairy cows, A. C. M'CANDLISH and J. P. STRUTHERS (*Jour. Dairy Res. [London], 6 (1935), No. 3, pp. 303–306*).—In a series of trials at the West of Scotland Agricultural College, cows were fed 1 lb. of butterfat daily either as cream or melted butter in their ration during the second and fourth 10-day periods of a 50-day experimental period. Some difficulty was encountered in getting cows to consume completely the ration containing the butterfat. No significant differences in yield or composition of milk due to feeding butterfat were noted.

The effect of variations in feeding on dairy cows yielding milk of poor quality, A. W. STEWART and J. F. TOCHER (Jour. Dairy Res. [London], 7 (*1936*), *No. 1, pp. 1–13, figs. 4*).—In experiments with four cows known to produce milk consistently low in solids-not-fat, changing from winter rations to good pasture caused a pronounced increase in both yield and percentage of solids-not-fat in the milk. Feeding a well-balanced ration over two lactation periods resulted in a slight but significant increase in both yield and solids-not-fat during the second lactation. Feeding a high protein ration (nutritive ratio of 1:2.76) did not affect the yield or the casein content but lowered solids-not-fat and lactose and increased total nitrogen, while a high carbohydrate ratio (nutritive ratio of 1:9.9) caused only a slight decrease in solids-not-fat.

Why do fat tests vary? A perpetual query, J. C. MARQUARDT and H. L. DURHAM (*Farm Res. [New York State Sta.], 3 (1936), No. 1, p. 2, fig. 1*).—This article deals with general conditions such as feeding and management of the herd, climatic conditions, the mechanical limitations of the milk test bottle, and the human element involved in testing, all of which may cause variation in the fat test in a mixed herd sample from one testing period to another.

An unusual variation in the butterfat content of milk, K. HARTLEY and D. W. H. BAKER (*Jour. Dairy Res. [London], 6 (1935), No. 3, pp. 353–362*).—This

report from the Agricultural Department, Nigeria, describes a condition consistently noted during the four years 1931–34, in which the butterfat content of milk produced on the government farm is higher in the morning than in the evening during the wet season, April to September, while the reverse is true during the dry season, October to March. Although the milk yield was greater for the morning milking throughout the year, simulating wet season feeding conditions during the dry season failed to prevent this reversal, indicating that the marked climatic differences between the two seasons is the causative factor.

Vitamin D studies in cattle, III, IV (*Jour. Dairy Sci., 19 (1936), Nos. 5, pp. 291–303; 6, pp. 359–372; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 57, 58, 61*).—This series of studies has been continued (E. S. R., 74, p. 688).

III. Influence of solar ultraviolet radiation upon the blood chemistry and mineral metabolism of dairy calves, C. W. Duncan and C. F. Huffman.—Three groups of Holstein calves were started on a rachitogenic ration at 90 days of age. One group kept outdoors during the day grew normally with neither physical condition nor blood values indicating any evidence of rickets, although there was a tendency to increase storage of calcium and phosphorus during the summer months with a corresponding decrease during the winter months. The remaining calves, deprived of direct sunlight, all developed definite signs of rickets, first indicated by a constant downward trend in either calcium or inorganic phosphorus content of the plasma, or both, and later by anorexia, decrease in growth rate, stiffness and bowing of the forelegs, and reduction of the mineral content of the bones.

Allowing one group of the rachitic calves exposure to direct early spring sunshine resulted in a marked increase in the concentration of plasma calcium and inorganic phosphorus and other evidence of curative effect. The remaining calves, continuously deprived of solar radiation, developed acute rickets with the inorganic phosphorus reaching an extremely low level. These results demonstrated that solar radiation enabled or permitted the calves to utilize material present in the ration but unavailable in the absence of sunlight or a supplementary form of vitamin D.

IV. Corn silage as a source of vitamin D for dairy cattle, H. E. Bechtel, C. F. Huffman, C. W. Duncan, and C. A. Hoppert.—Samples of corn silage were assayed for vitamin D according to standard line-test procedure with rats and were found to contain from 122 to 165 U. S. P. rat units per pound of air-dried material. Five groups of Holstein calves were used to determine the antirachitic value of corn silage for dairy calves in both curative and preventive trials. In all cases calves under 190 days of age on the basal rachitic diet failed to consume sufficient silage to either prevent or cure rickets while in older calves, with one exception, the daily consumption of from 7 to 10 g of dry matter in silage per kilogram of live weight was effective in curing or preventing this disease. This level of intake was also sufficient for normal growth and reproduction in cows, indicating that silage prepared from corn at the normal stage of maturity possesses definite antirachitic quality.

A study of the vitamin D requirements of calves when natural milk furnished the sole source of the antirachitic factor, J. W. Long, C. F. Huffman, and C. W. Duncan (*Milk Plant Mo., 25 (1936), No. 7, pp. 30–36, 72, figs. 10*).—This study at the Michigan Experiment Station involved the use of three lots of Holstein calves, each receiving a basal rachitic diet after 70 days of age. All calves in the lot receiving a supplement of skim milk became rachitic in spite of the favorable calcium-phosphorus ratio in their diet. Individuals in the second lot, carried during the winter months and receiving a supplement of fresh whole milk, showed varying degrees of resistance to rickets. Apparently a daily intake of from 0.3 to 0.4 U. S. P. units of vitamin D per pound of live

weight met the requirements for growing calves, provided normal levels of plasma magnesium were maintained. The third lot, carried during the summer months and receiving summer-produced whole milk, had a higher vitamin D requirement than the winter calves (group 2). The close relationship between magnesium metabolism and rickets is emphasized as probably accounting for the difference in response to winter and summer whole milk.

Incomplete milking in relation to milk production and udder troubles in dairy cows, T. E. Woodward, R. P. Hotis, and R. R. Graves (*U. S. Dept. Agr., Tech. Bul. 522 (1936), pp. 27, figs. 11*).—This study is based on 83 complete lactation records made by 14 cows, all records being made on machine milking. Each cow had completed at least one lactation record when being milked completely and at least one when milked incompletely. The methods employed included a complete record of milk production, periodic tests for butterfat, the examination of weekly milk samples for chloride content, cell count, number of total bacteria, and number of streptococci, and also frequent examinations of the udder by palpation for the detection of lumps, swellings, or other abnormalities, and the use of the strip cup for detecting curd particles in the milk.

The quantity of milk left in the udder by incomplete milking varied from 0.8 to 2.1 lb., and averaged 1.2 lb. Computing all immature records to a mature equivalent basis (practically all records were made by mature cows) and comparing production for the two groups, it is shown that the cows when milked incompletely throughout a lactation period produced 96.7 percent as much as, or 306 lb. less milk than, when milked completely. Considering the average of all lactations, incomplete milking apparently did not affect the percentage of butterfat in the milk or the rate of decline in milk production; neither did it increase the incidence of mastitis, the number of cells in the milk, nor the total number of bacteria or number of streptococci present.

As a practical application it appears that while for economic reasons it is not desirable to leave much milk in the udder, neither is it desirable to spend so much time attempting to get the "last drop" of milk that the cost of stripping exceeds the value of the milk obtained. Manipulation of the udder to accomplish complete milking required an average of 39 sec. per milking and yielded a net return at the rate of 59 lb. per hour.

Managing the dairy bull, C. S. Rhode and W. A. Foster (*Illinois Sta. Circ. 460 (1936), pp. 11, figs. 8*).—This circular describes the construction of suitable lots and buildings for housing, along with suggestions on the management and feeding of the dairy bull.

No "best" breed of milk goats, J. C. Marquardt (*Farm Res. [New York State Sta.], 3 (1936), No. 1, p. 10, fig. 1*).—The results of 55 State and 2 national goat-milk scoring contests gave no indication that breed enters into the question of quality milk production. Proper feeding practices, employing sanitary methods, and producing milk high in lactose and low in chlorides are deemed the most important considerations in quality goats' milk production.

The relationship of composition to quality in goat milk, J. C. Marquardt (*Goat World, 20 (1935), No. 11, pp. 7–9*).—The New York State Experiment Station has studied the relationship between flavor score and the composition of samples of goat milk entered in a recent national scoring contest. Flavor scores were not significantly related to either the fat or total solids content of the milk or to titratable acidity or curd tension. A high milk sugar content was associated with better quality milk, while a high salt content adversely affected the flavor.

The yield and composition of the milk of the ewe, W. Godden and C. A. Puddy (*Jour. Dairy Res. [London], 6 (1935), No. 3, pp. 307–312*).—This paper from the Rowett Research Institute presents data on the yield and composition

of the milk of ewes kept under controlled experimental conditions throughout a lactation period and also from ewes under natural grazing conditions in Scotland. No significant differences in the composition of the milk resulting from the different rations were detected.

Machine milking compared with hand milking [trans. title], H. W. ESKEDAL (*Beret. Forsøgslab. K. Vet. og Landbohøjskoles* [*Denmark*], *160* (*1935*), *pp. 74, figs. 20; Eng. abs., pp. 72–74*).—Based on a series of trials comparing the effectiveness of machine and hand milking, it is concluded that hand-milked cows will yield more milk than machine-milked cows, due primarily to the slower rate of decline with advance of lactation in the former group.

The rate of milking by machine, A. S. FOOT (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 3, pp. 313–319, figs. 6*).—In a study of the response of individual cows to milking machines, conducted at the National Institute for Research in Dairying, a wide range in duration of milking was observed, the coefficient of correlation between yield and milking time being 0.429. Curves showing the rate of milking at various stages during the operation for different yield groups are presented. Maximum rate of flow was reached in about 2 min. for all yield groups, with high-yielding cows showing a much more rapid rate of flow and a more rapid decrease near the end of the milking period.

Factors affecting milk and butterfat secretion, I, II, E. O. WHETHAM and J. HAMMOND (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 3, pp. 320–339, figs. 5; pp. 340–352, figs. 2*).—These two studies were carried on at the School of Agriculture, Cambridge.

I. *Variations in fat weight, fat percentage, and the amount of fat in the milk required to make a given weight of butter.*—Summarizing the records obtained from English dairy show milking trials over a 10-yr. period, data are presented for 11 cattle breeds on the average milk and fat yield, percentage of butterfat, and the fat: butter ratio, i. e., the pounds of fat as determined by the Gerber test required to make 1 lb. of butter.

By regrouping the data the effect of level of production, stage of lactation, and age on the percentage of fat and the fat: butter ratio has been determined. It is suggested that the fat: butter ratio is determined by the size of the fat globules in the milk. It is presumed that size of globule is determined, first, by the rate of butterfat formation by the cells, and, second, by the rate of milk secretion, i. e., the rate at which globules are washed out of the cells. It is further suggested that when milk yield is increased due to an increased rate of secretion (stage of lactation) the fat content is reduced, but when milk yield is increased due to an increased number of secreting cells (age) the fat content is unaffected.

II. *The color of the butterfat.*—A study of the color of the butterfat from the above-described milk samples indicates that the genetic character of the cow and the method of feeding are the principal determining factors. Conditions leading to increased milk yield generally cause slight increase in color of the fat. Butterfat derived from body fat is normally lower in color than that derived from feed when the latter contains reasonable amounts of plant pigment.

The influence of high environmental temperature on the secretion and composition of milk.—A preliminary note, S. BARTLETT (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 3, pp. 283–288*).—In a series of trials four cows were kept either in rooms at 80° F. or in barns at normal winter temperature (average about 40°). A study of the yield and composition of the milk produced indicated that a significant lowering of the solids-not-fat occurred at the higher temperature, while milk yield and percentage of butterfat were slightly reduced. No changes in other constituents of the milk and blood were detected.

Investigations on the milk of a typical herd of Shorthorn cows.—III, Nitrogen distribution, chloride, lactose, copper, and iron content over a period of two years, W. L. DAVIES (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 3*, *pp. 363–368*).—Continuing this series of investigations (E. S. R., 75, p. 686), weekly samples of milk from a herd of Shorthorn cows have been analyzed for total nitrogen and nitrogen distribution, lactose, chlorine, iron, and copper. A complete tabulation of these results is presented, with the suggestion that they may serve as a comprehensive standard of typical Shorthorn milk.

Seasonal variations in the freezing point of South African milk, L. DENIS-LESTER (*Union So. Africa Dept. Agr. and Forestry Bul. 156* (*1936*), *pp. 14*, *fig. 1*).—Based on freezing point determinations of milk samples from 7 herds at approximately 2-week intervals throughout 1 yr., it is concluded that the limits within which the freezing point of the milk samples varied (from 0.528° to 0.556° C.) did not show any material difference from month to month and hence were in no way correlated with the rations supplied or with meteorological conditions.

Influence of period of lactation on the freezing point of South African milk, L. DENIS-LESTER (*Union So. Africa Dept. Agr. and Forestry Bul. 157* (*1936*), *pp. 8*, *figs. 2*).—Based on freezing point determinations of milk samples from 45 cows taken at approximately 2-week intervals throughout the lactation period, it is concluded that the variations which occur in the freezing point of milk are in no way due to the period of lactation of the cow from which the sample is obtained.

A preliminary study of the vitamin A content of milk and colostrum, B. L. KUNERTH, M. M. KRAMER, and W. H. RIDDELL (*Kans. Acad. Sci. Trans.*, *38* (*1935*), *pp. 209–211*, *fig. 1*).—This preliminary report from the Kansas Experiment Station indicates that the vitamin A content of colostrum is 10 times greater than that of normal milk produced by the same cow, while a comparison of the colostrum from two different cows showed one to be twice as potent in vitamin A as the other. Feeding 2 g of the more potent of these colostrum samples gave results comparable to that obtained from feeding 28 γ of standard carotene as a vitamin A supplement in the rat diet.

The influence of storage, pasteurization, and contamination with metals on the stability of vitamin C in milk, C. H. WHITNAH, W. H. RIDDELL, and W. J. CAULFIELD (*Jour. Dairy Sci.*, *19* (*1936*), *No. 6*, *pp. 373–383*).—Studies conducted at the Kansas Experiment Station indicate that milk either raw or pasteurized by the high temperature short-time process but uncontaminated with copper may be stored for from 24 to 48 hr. with very little loss of vitamin C. The 30-min. holding process of pasteurization resulted in excessive loss of vitamin C, both during pasteurization and during the subsequent storage, even when contamination with copper was reduced to a minimum.

The addition of 5 parts per billion of copper to pasteurized milk increased the loss of vitamin C during a 24-hr. storage period. The addition of 0.3 g of copper daily to the ration of a cow decreased the stability of vitamin C in the pasteurized milk, presumably due to an increase in the copper content of the milk, though this could not be detected by chemical analysis. Adding 0.1 p. p. m. of iron or 1 p. p. m. of chromium or nickel has less deteriorating effect on vitamin C than 5 parts per billion of copper.

Milk and dairy products, W. B. PALMER ET AL. (*Amer. Pub. Health Assoc. Yearbook, 1935–36*, *pp. 54–57*).—In this report of the Committee on Milk and Dairy Products, the lack of uniformity in administrative control of vitamin D milks, both in production and labeling, is discussed. Establishment of a reliable irradiation technic and equipment with suitable indicating and recording devices are recommended to permit effective supervision by routine inspec-

tion. Certified milk is discussed from the standpoint of pasteurization and composition. Misinformation on milk by various consumer organizations is condemned.

The flavor of milk (*New York State Sta. Circ. 167 (1936), pp. 4*).—The causes of the most common off flavors encountered in the production and handling of milk are briefly discussed, and certain precautions to be observed by the producer, the distributor, and the consumer as guards against the development of off flavors are suggested.

Some effects of the proposed new bacteriological techniques, J. F. Phelan (*Jour. Dairy Sci., 19 (1936), No. 6, pp. 385–394*).—In a series of tests covering the examination of 1,962 samples of various dairy products, either standard agar at 32° or tryptone agar at 37° showed a marked increase in number of bacterial colonies over the standard method, while tryptone agar at 32° showed a still greater increase which in certain cases represented a tremendous variation over the standard method. The author emphasizes the need for careful study of proposed new methods and a proper balance of methods and bacterial standards before changes in existing standard methods are made.

***A study of the bacterial flora of foremilk and of rennet extract,* with special reference to acid-proteolytic types,** N. R. Knowles (*Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 63–74*).—In a study of the bacterial flora of foremilk and of rennet extract, particular reference is made to the acid proteolytic types which probably have a significant effect in the cheese-ripening process. Both materials were found to yield acid-proteolytic cocci which were largely classified either as *Staphylococcus* sp., *Micrococcus caseolyticus*, *M. freudenreichii*, and *Streptococcus liquefaciens*. Comparatively few of the cultures isolated from either foremilk or from fresh rennet were proteolytic, while old rennet samples were more productive of this type. Many cultures which failed to show peptonization of milk were capable of liquefying gelatin and may be of aid in the final stages of protein break-down in the cheese-ripening process.

Acid production and protein degradation of some acid-proteolytic cocci, N. R. Knowles (*Jour. Dairy Res. [London], 7 (1936), No. 2, pp. 176–181*).—Sterilized milk samples were inoculated with certain strains of the cocci shown above to be present in foremilk and in rennet extract and incubated at 30° C. Tubes from each series were removed after 1, 2, 3, and 4 weeks' incubation and subjected to pH determination and fractional nitrogen analysis.

The cultures of *Streptococcus liquefaciens* were the most active proteolytic type, causing the decomposition of from 62 to 70.5 percent of total milk protein, principally during the first week of incubation, accompanied by strong acid production. Strains of staphylococci were mildly proteolytic, but all were described as of the acid-proteolytic type. *Micrococcus caseolyticus* strains differed widely in proteolytic activity (from 18 to 42 percent protein decomposition) and were mild acid producers. *M. freudenreichii* strains were proteolytic (from 19 to 34 percent) and also decidedly ropy in milk, but did not produce acid. Practically all proteolytic types were characterized by the formation of water-soluble protein decomposition products, with little effect on the amino acid content of the milk. It is suggested that these organisms may, if present in sufficient numbers, contribute to the general protein degradation during cheese ripening, but it is likely that their presence is undesirable because of the possible ill effect upon flavor.

Home pasteurization of streptococcus-infected milk, C. S. Bryan, O. J. Robinson, and J. W. Severens (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 44–48*).—The results presented from tests with 418 cultures from the milk of mastitis-affected cows indicate that either applying heat directly to milk until

the milk starts to boil or heating milk in a double boiler until the water in the outer container boils is a safe method of home pasteurization of milk so far as destroying the streptococci of mastitis is concerned. Since boiling milk causes an undesirable scum formation and imparts a cooked flavor to milk, the latter method is preferable. Proper commercial pasteurization of milk kills all mastitis streptococci with a sufficient margin of safety to allow for slight variations in pasteurization temperature encountered when large volumes of milk are heated.

Cheese making an ancient art in Italy, J. A. DE TOMASI and C. D. KELLY (*Farm Res.* [*New York State Sta.*], *3* (*1936*), *No. 1, pp. 5, 9, figs. 4*).—This article gives a brief résumé of the development and the present status of the cheese industry in Italy, with particular reference to the role of topography in determining the types of cheese produced in the different sections of the country (E. S. R., 75, p. 689).

VETERINARY MEDICINE

The practice of veterinary medicine, D. H. UDALL (*Ithaca, N. Y.: Author, 1936, 2. ed., pp. 273+[7], figs. 81*).—In the preparation of this second edition of the work previously noted (E. S. R., 71, p. 96), the entire text is said to have been reviewed and brought up to date.

Physiology in modern medicine, J. J. R. MACLEOD ET AL. (*St. Louis: C. V. Mosby Co., 1935, 7. ed., pp. XXXII+1154, pls. 7, figs. 290*).—This is a seventh revised edition of this work (E. S. R., 57, p. 590).

[Report of work in animal pathology by the Nevada Station] (*Nevada Sta. Rpt. 1935, pp. 15, 19, 20, 21*).—The work of the year referred to (E. S. R., 73, p. 98) includes that with several poisonous range plants, namely, *Hymenoxys lemmonii*, *Corydalis caseana*, and *Lupinus confertus*, by C. E. Fleming, M. R. Miller, L. R. Vawter, and A. Young; hemorrhagic disease in cattle, including tests of immunity and methods of immunizing (alum treated cultures), lymphangitis in cattle, and encephalomyelitis in equines, including a comparison of the eastern and western strains of the virus (E. S. R., 73, p. 544), tests of susceptibility, alteration of the virus by continuous passage through guinea pigs, localization of the virus in the horse, and mode of transmission, all by E. Records and Vawter.

Animal diseases and pests ([*Gt. Brit.*] *Min. Agr. and Fisheries, Rpts. Agr. Res. Insts.* [*etc.*], *1933–34, pp. 323–328*).—Work with bovine tuberculosis, the sheep maggot fly (*Lucilia sericata* et al.), infectious bovine abortion, worm infestation of sheep, fowl paralysis, and foulbrood disease of bees is reported upon.

[Contributions on comparative pathology] (In *3. International Congress of Comparative Pathology, Athens, 1936. Athens: "Eleftheroudakis", 1936, vol. 1, Rpts., pt. 1, Sect. Vet. Med., pp. 1–193, 197, 198, fig. 1*).—Among the contributions presented at the Third International Congress of Comparative Pathology (E. S. R., 68, p. 526), held at Athens in April 1936, are the following, with French abstracts: The *Echinococcus* Disease of Domestic Animals [trans. title], by C. Tenhaeff and S. Ferwerda (pp. 3–24, abs. pp. 23, 24); Leptospirosis of the Dog [trans. title], by A. Klarenbeek (pp. 27–32, abs. p. 32); The Spirochetoses of Animals [trans. title], by J. Verge (pp. 33–66, abs. pp. 65, 66); Braxy in Iceland, by N. Dungal (pp. 69–80, abs. pp. 79, 80); The Place of Blackleg Among the Gas Edemas [trans. title], by H. Miessner and G. Schoop (pp. 81–102, abs. pp. 101, 102); General Report on Diseases of Domestic Animals Due to Anaerobes [trans. title], by B. Ananiadès and G. Debonéra (pp. 103–118, abs. p. 118); The Relation of Sheep Pox to Vaccinia and Variola [trans.

title], by H. A. Gins (pp. 121–139, abs. pp. 138, 139); Fowl Pox [trans. title], by T. van Heelsbergen (pp. 140–154, abs. p. 154); The Sheep Pox Virus [trans. title], by A. Donatien and F. Lestoquard (pp. 155–181, abs. p. 181); and Goat Pox [trans. title], by C. Mélanidi and N. Tzortzaki (pp. 182–193, abs. pp. 192, 193).

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 15 (1936), No. 1, pp. 1–118, pls. 13, fig. 1; Eng., pp. 1–19*).—The contributions presented include the following: Haemacytological Changes in Hog Cholera—II, Observations on White Cells and Blood-Platelets, by S. Ishii, S. Watanabe, and M. Ozaki (Japan. abs. pp. 1–3, Eng. pp. 1–8) (E. S. R., 75, p. 103); Experimental Studies on the Infectious Abortion in Mares—III, Clinical Observations, by R. Kurosawa, E. Tatezawa, K. Hirato, and K. Kasai (pp. 4–29, Eng. abs. pp. 9–12) (E. S. R., 75, p. 104); Studies on *Corynebacterium pyogenes*, I, by Y. Ochi and K. Zaizen (pp. 30–57, Eng. abs. pp. 13, 14); and Studies on Blackhead—I, Morphology, Development, and Pathogenicity of Causal Agent in Body of Host, by D. Niimi (pp. 58–118, Eng. abs. pp. 15–19).

[Animal diseases and parasites in Kenya Colony] (*Kenya Dept. Agr. Ann. Rpt., 1934, vols. 1, pp. 114–145; 3, pp. 2–32*).—A report of the occurrence of and control work with diseases and parasites of domesticated and wild life (E. S. R., 73, p. 383), that in volume 1 by H. H. Brassey-Edwards and that in volume 3 by R. Daubney.

Control of animal parasites: General principles and their application, M. C. Hall (*Evanston, Ill.: North Amer. Vet., 1936, pp. 162, [figs. 26]*).—Following a preface, the author deals with the subject under these headings: Strategy and tactics of warfare on parasites, a military history of the American war against cattle fever ticks and piroplasms, campaign against yellow fever and malaria on the Isthmus of Panama, combat against sheep scabies in the United States, outline for a campaign against the common sheep liver fluke (*Fasciola hepatica* L.) and the large American cattle fluke (*F. magna*) in the United States, should we declare war on ox warbles, swine sanitation—a battle or a campaign, trichina—a deadly and not yet defeated enemy, fighting *Haemonchus*, a stalemate in the war on anaplasma, the campaign against the beef tapeworm (*Taenia saginata*), the campaign against horse bots, combating dog ascarids, the war on dog hookworms, campaigning against coccidiosis, defeating *Dipylidium*, fighting dog fleas (the dog flea and the human flea), fighting the cruel heart worm, the amebiasis campaign, the campaign against the pinworm, man against hookworms, and combating hydatid. The war on livestock parasites (E. S. R., 68, p. 812) and anthelmintic warfare are considered in an appendix. The control procedures are outlined in chart form.

Epizootological data from laboratory diagnoses, V. M. Michael and R. Graham (*Vet. Med., 31 (1936), No. 3, pp. 114–124, figs. 12*).—Data obtained from post-mortem, bacteriologic, serologic, microscopic, and pathologic examinations of more than 100,000 specimens received during a period of 4 yr. from diseased herds and flocks in Illinois are analyzed and summarized in 11 graphs.

A catalog and host-index of the genus Plasmodium, G. R. Coatney and R. L. Roudabush (*Jour. Parasitol., 22 (1936), No. 4, pp. 338–353*).—This catalog of species and host index is presented with a five-page list of references to the literature.

Experimental epidemiology, M. Greenwood, A. B. Hill, W. W. C. Topley, and J. Wilson (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 209 (1936), pp. 204, pls. 4, figs. 4*).—Following an introduction in which it is stated that the studies outlined have been under way for some 15 yr., the report deals with (1) the course of events in a herd of mice infected with *Bacterium aertrycke*, *B.*

enteritidis, and *Pasteurella muriseptica* recruited by continuous immigration; (2) the course of events in a long-continued epidemic as revealed by a cage-age life table; (3) a study of the experimental epidemiology of ectromelia infection; (4) the effect of vaccination on herd mortality; (5) the effect of variations in microbial virulence and infectivity and the possible development of epidemic strains; (6) the infectivity of mice immunized against ectromelia before and after the further injection of fully active virus; (7) the effect of diet on the epidemic spread of infection; (8) the role of bacteriophage in epidemics of mouse typhoid; and (9) the effect of dispersal of an infected herd. A three-page list of references to the literature is included.

Blood groups and blood transfusion, A. S. WIENER (*Springfield, Ill.: Charles C. Thomas, 1935, pp. XIV+220, figs. 41*).—One of the 18 chapters of this work (pp. 170–181) deals with individual differences in animal blood under the headings of isoagglutination in the blood of apes, methods of demonstrating individual differences in the blood of animals, and individual differences in the bloods of (1) monkeys, (2) cattle and sheep, (3) fowl, and (4) other animals.

A new toxicant occurring naturally in certain samples of plant foodstuffs.—VII, Low hatchability due to deformities in chicks produced from eggs obtained from chickens of known history, K. W. FRANKE and W. C. TULLY (*Poultry Sci., 15 (1936), No. 4, pp. 316–318, fig. 1*).—Continuing this phase of the study (E. S. R., 74, p. 378), four pens of laying hens were fed rations containing normal grain, 65 percent of toxic grain, 25 percent of toxic corn, and 25 percent of toxic barley, respectively. Over a 4-mo. winter period these lots produced 53.4, 5.57, 36.54, and 35.53 eggs per hen. A high percentage of fertility was noted in all lots of eggs, but hatchability of eggs from the hens receiving 65 percent of toxic grain was severely affected, and examination of the unhatched eggs showed the presence of monstrosities similar to those previously noted as occurring on affected farms. Figures are presented to show the type of monsters observed. The correlation between the feeding of toxic grain and the occurrence of monsters seems definitely established.

[A new toxicant occurring naturally in certain samples of plant foodstuffs.—VIII], Effect of certain salts on enzyme activity: Effect of sodium selenate, selenite, selenide, tellurite, sulfate, sulfite, sulfide, arsenite, and vanadate on rate of carbon dioxide production during yeast fermentation, A. L. MOXON and K. W. FRANKE (*Indus. and Engin. Chem., 27 (1935), No. 1, pp. 77–81, figs. 8*).—Continuing the above study of the toxicity of selenium compounds, when equivalent mols of selenium, vanadium, arsenic, tellurium, and sulfur were added to the basic mixture, the toxicity as measured by the rate of carbon dioxide production during yeast fermentation of glucose declined in the order listed, with sulfur showing a slight accelerating effect. In comparing the sodium salts of selenium the selenite was decidedly toxic and the selenide less toxic, while the selenate showed only a slight inhibiting effect. The accelerating effect of sodium sulfide and to a lesser extent of sodium sulfite is attributed to the production of hydrogen sulfide. The addition of sodium sulfide counteracted the toxicity of the selenium salts, apparently due to the precipitation of selenium by hydrogen sulfide. The addition of sodium sulfite, ammonium sulfate, and sodium thiosulfate failed to counteract selenium toxicity.

[A new toxicant occurring naturally in certain samples of plant foodstuffs.—XII,] Monstrosities produced by the injection of selenium salts into hens' eggs, K. W. FRANKE, A. L. MOXON, W. E. POLEY, and W. C. TULLY (*Anat. Rec., 65 (1936), No. 1, pp. 15–22, figs. 2*).—Continuing this series of investigations (E. S. R., 74, p. 526), various concentrates of selenium, both in the form of sodium selenite and sodium selenate, were injected in the air cell of nor-

mally produced fertile eggs, which were then incubated by regular procedure. The selenium injections resulted in the production of monsters similar to those occurring naturally (E. S. R., 74, p. 378). Concentrations of from 0.6 to 0.8 p. p. m. gave the greatest percentage of abnormal embryos. At greater concentrations development was entirely prevented or a high percentage of mortality of embryos occurred, while lower concentrations permitted a high percentage of normal embryos to develop. Injections of salts of arsenic, lead, and fluorine in sublethal concentrations produced ectopic conditions in embryos, but did not produce monsters.

"Alkali disease"—selenium poisoning, F. Stenn (*Arch. Path., 22 (1936), No. 3, pp. 398–412*).—This review of the present knowledge of selenium poisoning is presented with a list of 46 references to the literature.

Is the use of arsenical insecticides dangerous to wild game and farm animals? [trans. title] A. Chappellier and M. Raucourt (*Ann. Épiphyt. et Phytogénét., n. ser., 2 (1936), No. 2, pp. 191–239, fig. 1*).—Toxicity experiments with arsenicals conducted with the rabbit and other game animals are reported upon, accompanied by a list of 23 references to the literature.

Experimental thallium-poisoning of dog and fowl, U. Plazikowski and S. Svensson (*Skand. Vet. Tidskr., 26 (1936), No. 2, pp. 68–86, figs. 8; Eng. abs., pp. 85, 86; abs. in Vet. Jour., 92 (1936), No. 7, pp. 265, 266*).—A description is given of cases of thallium poisoning of dogs and fowls by the administration of Zelio-corn and Zelio-paste, two rat poisons containing some thallium. The lethal dose for a dog of medium size appears to lie between 0.1 and 0.2 g of thallium sulfate. The lethal dose in the case of fowls seems to be between 0.05 and 0.06 g of thallium sulfate, corresponding to about 70 grains of Zelio-corn.

The most characteristic symptoms of thallium poisoning in dogs appear to be a rapid emaciation, difficulty in respiration, eczema, and a falling off of the hair. In fowls the most prominent signs of poisoning were a bluish discoloration of the comb and wattle, paralysis of the legs, and diarrhea.

Technic for skin irritation tests: A technic for determining the irritating effects of chemical compounds, J. L. Etchells and F. W. Fabian (*Jour. Indus. Hyg., 17 (1935), No. 6, pp. 298–300, figs. 2; abs. in Michigan Sta. Quart. Bul., 19 (1936), No. 1, p. 55*).—A description is given of a method for determining the irritating effect of chemicals by animal tests. In each test rabbits were used with good results, it having been found possible to test three different dilutions of the same chemical at the same time on one animal. This makes their comparative action easy to determine. Volatile substances may be tested accurately.

Insecticidal action of some disinfectants and other materials on Trichophyton equinum in hair [trans. title], E. A. R. F. Baudet (*Tijdschr. Diergeneesk., 63 (1936), No. 15, pp. 835–839, 840; Ger., Eng., Fr. abs., pp. 839, 840*).—In a study of the fungicidal action of various disinfectants on *T. equinum* in hair from guinea pigs artificially infected, 3 percent carbolic acid and 3 percent formalin gave the best results, the organism having been killed after a half hour's exposure.

The therapeutic action of Lucilia sericata larvae [trans. title], A. Maurice (*Ann. Parasitol. Humaine et Compar., 14 (1936), No. 1, pp. 35–47, pl. 1*).—The treatment of 18 separate cases by the application of maggots of *L. sericata* is reported upon and a list given of 22 references to the literature.

Progress of maggot therapy in the United States and Canada in the treatment of suppurative diseases, W. Robinson (*Amer. Jour. Surg., n. ser., 29 (1935), No. 1, pp. 67–71*).—This review is presented with a list of 53 references to the literature.

Maggot therapy: A rapid method of removing necrotic tissues, L. K. FERGUSON and C. W. MCLAUGHLIN, JR. (*Amer. Jour. Surg., n. ser., 29 (1935), No. 1, pp. 72–84, figs. 2*).—It is pointed out that maggot therapy is useful not only in the treatment of osteomyelitis but with other wounds containing sloughing tissue that can be exposed by adequate incision. Successful use of maggots demands adequate exposure of the necrotic area, discomfort being largely avoided by preventing overcrowding. Simplified methods of dressings for use with maggots are described.

Is Aujeszky's disease transmitted by the bite of an infected animal? [trans. title], P. REMLINGER and J. BAILLY (*Bul. Acad. Vét. France, 9 (1936), No. 3, pp. 192–199*).—In experimental injections of guinea pigs the virus of Aujeszky's disease was found to be present in the salivary glands, but the injection of the rabbits with the saliva from affected guinea pigs resulted negatively in all but one case. The authors conclude that while such transmission may be brought about, it is of scientific interest only and not of practical importance.

Bibliography of work on brucelliases during the years 1932–34 [trans. title] (*Rev. Microbiol. Appl., 2 (1936), Nos. 1, pp. 28–32; 2, pp. 94–98; 3, pp. 137–145*).—A classified list is given of references to the literature for the years 1932–34, inclusive.

Influenza infection of man from the ferret, W. SMITH and C. H. STUART-HARRIS (*Lancet [London], 1936, II, No. 3, pp. 121–123, fig. 1*).—The authors report upon a case of influenza in man and present evidence that the infection was contracted through a violent sneeze at close range of a ferret which had been infected 3 days previously with the passage strain of the human influenza virus. The immunological response of the patient to virus infection is referred to, and the practical significance of the results discussed.

Salmonella suipestifer bacteremia, with pericarditis, pneumonitis, and pleural effusion: Report of a case, L. COHEN, H. FINK, and I. GRAY (*Jour. Amer. Med. Assoc., 107 (1936), No. 5, pp. 331–333, fig. 1*).—A case report of *S. suipestifer* infection in man. It is pointed out that since the World War there has been increasing evidence of a definite relationship of the so-called "hog cholera bacillus" to human disease.

Natural infection of American human trypanosomiasis in two species of cone-nosed bugs, Triatoma protracta Uhler and Triatoma uhleri Neiva, in the western United States, C. A. KOFOID and B. G. WHITAKER (*Jour. Parasitol., 22 (1936), No. 3, pp. 259–263*).—In addition to *T. protracta*, natural infection of which with *Trypanosoma cruzi* (*triatomae*) was first reported in the United States by Kofoid and I. McCulloch[2] in 1916, *T. uhleri* has been found naturally infected with this trypanosome. A new area, in the vicinity of Tucson, Ariz., has been discovered as a region of infected vectors, infected bugs having been found in this area in houses and in beds. The trypanosome infection is transmitted to man by contamination. The infective stages of the trypanosome are discharged from the rectum of the bug immediately after feeding, or shortly thereafter. Presumably, should these infective stages of the trypanosome be rubbed into the lesion made by the bug or into lesions made by scratching, infection of the bitten person might ensue.

Naturally acquired tuberculosis in various animals: Some unusual cases, A. S. GRIFFITH (*Jour. Hyg. [London], 36 (1936), No. 2, pp. 156–168*).—Cases of tuberculosis that occurred naturally in a bat, bear, bison, hedgehog, kangaroo, mink, goat, horse, calf, and a parrot are reported.

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[2] Calif. Univ. Pubs. Zool., 16 (1916), No. 10, pp. 113–124, pls. 2.

The incidence of the bovine [tubercle] bacillus in lesions found in man, M. H. Brown (*Canad. Pub. Health Jour., 27 (1936), No. 2, pp. 88, 89*).—From a total of 241 strains of tubercle bacilli isolated from various lesions in man in various parts of the Province of Ontario, 96.68 percent were found to be of the human type and 3.32 percent of the bovine type. The highest incidence of the bovine type occurred in strains isolated from spinal fluid, 10.2 percent being the bovine type. In no instance was the bovine type isolated from the pulmonary system.

Review of tularaemia in British Columbia, with special reference to a recent human case, T. K. Moilliet (*Canad. Ent., 68 (1936), No. 6, pp. 121–124*).—An account is given of the occurrence of this insect- and tick-transmitted disease of man, sheep, and other animals in British Columbia.

The significance of low agglutination titres in Bang's disease, H. L. Gilman and H. S. Cameron (*Cornell Vet., 26 (1936), No. 2, pp. 113–119*).—The authors report upon approximately 100 bovine sera of varying *Brucella* agglutinin content that were tested with 15 antigens made from organisms that do or might infect cattle. The results tend to show that the low agglutination titers in Bang's disease are not due to cross agglutination with these organisms.

On the agglutination value, 10, and its importance in the serological diagnosis of the disease, infectious abortion in cattle, S. Wall (*Skand. Vet. Tidskr., 26 (1936), No. 6, pp. 413–455, fig. 1; Eng. abs., pp. 451–455*).—The details of studies conducted are presented in tables that show how agglutination values originate in newly infected herds.

Transmissibility of Bang's disease among dairy cattle in a Utah dairy village, D. E. Madsen and O. G. Larsen (*Utah Sta. Bul. 272 (1936), pp. 12, figs. 4*).—A report is given of a study in Hyde Park, Utah, where the physical farm set-up is typical of many communities in that State, made with a view to determining the possibility of maintaining a herd free from Bang's disease. During the pasture season it is the usual practice in that village to drive milk cows daily to pasture some distance away. Each dairyman usually maintains his own private pasture, and there is considerable mingling of herds on the way.

The results have shown that the danger of clean herds contracting the infection through irrigation drainage from infected pastures is rather remote under the conditions existing in the particular community studied. Neither did the practice of driving cows to and from pasture in a more or less large group seem to greatly increase the spread of the disease.

Infection in nearly all newly infected herds was traceable either to the purchase of infected animals or to the practice of continuous contact by pasturing with a neighbor's infected stock. This is particularly true with reference to dry cows and heifers. The majority of herds which remained disease-free throughout the study avoided pasture contact with neighboring infected cattle, and the owners did not purchase infected cattle for herd replacements.

It is thought to be practicable in most instances to eradicate Bang's disease from herds in any similar community, even though some herds in such communities continue to act as reservoirs of infection. The importance of eliminating all diseased cattle from the community is emphasized. Should such a program become inoperative, a farmer might, in most instances, be able to protect his herd from Bang's disease if precautions be taken to avoid direct stable and pasture contact with infected cattle.

Of 69 cows observed which aborted and were tested for Bang's disease, 34 gave negative agglutination tests. At some time during the period studied, 50 percent of the reacting cows and 4.6 percent of the nonreacting cows aborted.

A study of the effect of Brucella abortus in udderless cows, B. H. EDGINGTON (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 3, pp. 225–233*).—Experiments were conducted at the Ohio Experiment Station with a view to determining whether the reactor cow that has aborted but has no udder infection may disseminate *B. abortus* during its subsequent gestation. In this work nonreactor heifers whose udders and supramammary lymph glands had been removed surgically when they were about 6 mo. old were experimentally infected by vaginal or conjunctival sac inoculation of *B. abortus* cultures. Following infection high agglutinin titers developed, and abortions occurred within 2 to 3 mo. Five to 6 mo. after aborting these cows were bred, at which time they had agglutinin titers of 1:400 or higher. *B. abortus* was not disseminated by these udderless reactor cows during their second gestation periods, as determined through their association with pregnant nonreactor heifers or by cultural tests and guinea pig inoculations of vaginal material and milk collected soon after they had calved.

A list of 26 references to the literature cited is included.

Results of examining pasteurized and unpasteurized milk for Brucella abortus, J. P. TORREY and R. GRAHAM (*Ill. State Acad. Sci. Trans.*, *28* (*1935*), *No. 2, pp. 207, 208*).—*B. abortus* was isolated by guinea pig inoculation from 50 percent of 62 raw-milk samples collected at milk depots in 28 widely distributed counties of Illinois. Pasteurization as employed in milk depots from which samples were collected is effective in destroying *B. abortus* in milk. *B. abortus*, bovine type, is apparently the most prevalent in milk of Illinois.

The western dog tick (Dermacentor occidentalis Neum.), a vector of bovine anaplasmosis in California, W. B. HERMS and D. E. HOWELL (*Jour. Parasitol.*, *22* (*1936*), *No. 3, pp. 283–288*).—In this contribution the authors report three hereditary transmissions of bovine anaplasmosis by ticks and add two new tick vectors, namely, the Pacific Coast tick and the winter tick, as vectors.

Detection of shedders of streptococci responsible for infectious bovine mastitis, W. N. PLASTRIDGE and E. O. ANDERSON (*Amer. Jour. Pub. Health*, *26* (*1936*), *No. 7, pp. 711–715, fig. 1*).—The data here contributed from the [Connecticut] Storrs Experiment Station are considered to confirm the findings of other workers that the common cause of infectious chronic mastitis is a fairly well-defined species or type of *Streptococcus* easily differentiated from *Streptococcus pyogenes* of human origin. A plan is described for differentiating *S. mastitidis* (group A) from weakly pathogenic and saprophytic streptococci of bovine origin.

"Microscopic examination of incubated milk samples was found to be the most effective of six methods used in detecting shedders of *S. mastitidis* (group A). As saprophytic streptococci may occasionally be found in incubated samples from healthy quarters, the significance of the finding of streptococci in incubated samples from healthy quarters, in the absence of other evidence of mastitis, or during the first 2 and last 4 weeks of the lactation period, can be determined only by isolation and identification of the *Streptococcus* found."

Non-venereal transmission of Trichomonas foetus infection in cattle, J. ANDREWS and F. W. MILLER (*Amer. Jour. Hyg.*, *24* (*1936*), *No. 2, pp. 433–438*).—A report is made of observations of four *T. foetus*-infected virgin heifers maintained at Beltsville, Md., under conditions in which venereal transmission could not have occurred. Possible means of infection are discussed, and it is concluded that natural contaminative transfer from female to female took place. It is suggested that infected cows and heifers as well as bulls should be segregated from uninfected stock. Uninfected bulls should not be bred to virgin

heifers without ascertaining as far as possible that the heifer is free from *T. foetus*.

A list is given of 15 references to the literature.

Wasting disease: Diagnosis, prevention, and treatment, J. F. FILMER and E. J. UNDERWOOD (*Jour. Dept. Agr. West. Austral., 2. ser., 13 (1936), No. 2, pp. 199–201*).—This report discusses a deficiency disease prevalent in Western Australia, particularly affecting lambs, sheep, and young cattle, and also older cattle to a considerable extent.

Limonite, an iron-bearing ore, provided in a lick, has been found effective in preventing this ailment. Later tests, however, have demonstrated that the cobalt in the ore is the actual curative agent rather than iron, with some evidence that minute quantities of nickel may also be effective. The administration of very dilute solutions containing cobalt chloride and nickel chloride in the ratio of 5:1 has given complete protection in all classes of livestock susceptible to this ailment.

Physiological aspects of ketosis in cows and ewes, with special reference to carbohydrate metabolism, J. SAMPSON and C. E. HAYDEN (*Cornell Vet., 26 (1936), No. 2, pp. 183–199, figs. 2*).—In this contribution, presented with a list of 37 references to the literature, an attempt is made to show that a definite relation exists between carbohydrate metabolism and the ketosis associated with the disorders known as acetonemia of cows and pregnancy disease of ewes.

Observations on cattle nematode infections, with a demonstration of their secondary transmission to grazing sheep, N. R. STOLL (*Jour. Parasitol., 22 (1936), No. 4, pp. 386–407*).—In the course of studies previously noted (E. S. R., 73, p. 543) a new pasture was established which, because of location and previous history, was free of helminthic infestation. To this area 10 lightly infected calves brought a variety of nematodes, 11 species of the 8 genera *Haemonchus*, *Trichostrongylus*, *Cooperia*, *Nematodirus*, *Capillaria*, *Trichuris*, *Gongylonema*, and *Setaria* having been demonstrated. Eight species were secondarily transmitted to a group of lambs reared free from helminths which, with their later offspring, were grazed with the cattle until 1933.

"The pasture has been maintained as a 'closed universe' of infection, no new animals being added except by breeding within the area. Clinical verminoses have been absent throughout a 5-yr. period. Differences in infection levels, however, are demonstrable between adult cattle and calves in terms of strongyloid egg outputs per day. Besides this greater insusceptibility of older animals, increased pasture infestation is demonstrable in 1935, the fifth grazing season, as compared to 1932, the second grazing season, although stocking in these 2 yr. was ½ head in 1935 compared to 1 head per acre in 1932."

Certain net effects in helminthic parasitism, with special reference to the sheep host, N. R. STOLL (*Cornell Vet., 26 (1936), No. 2, pp. 171–179*).—A discussion based upon studies conducted by the author at the Rockefeller Institute for Medical Research and noted previously (E. S. R., 75, p. 696) or above.

Ovine anaplasmosis in France [trans. title], J. CUILLÉ and P. L. CHELLE (*Rev. Gén. Méd. Vét., 45 (1936), No. 531, pp. 129–140*).—A further contribution on anaplasmosis (E. S. R., 73, p. 390; 74, p. 104), which has been found to be widespread among sheep in south and southwest France. Some individuals become carriers without signs of ill effects, the organism appearing in the blood when their organic resistance is lowered by an intercurrent affection.

Contagious mastitis of ewes due to Bacterium mastitidis [trans. title], LESBOUYRIES, BERTHELON, and MACRIDÈS (*Bul. Acad. Vét. France, 8 (1935), No. 10, pp. 522–528; abs. in Vet. Rec., 48 (1936), No. 24, p. 764*).—Reference is made to an outbreak of pneumonia in lambs which occurred simultaneously with one

of mastitis in the parent ewes. *B. mastitidis*, described by Dammann and Freese in 1907 (E. S. R., 19, p. 185), appeared in each case to be the cause.

On the incidence of the abomasal parasites in the lambs of south-west Britain, D. G. Davey (*Jour. Helminthol., 14 (1936), No. 2, pp. 85–92*).—The incidence of the abomasal parasites *Ostertagia circumcincta* (Stadelm. 1894), *Haemonchus contortus* (Rudolphi 1803), and *Trichostrongylus extenuatus* (Rail. 1898) in the lambs of southwest Britain, based upon examinations of some 600 lambs and counts of the parasite in 100 cases is reported.

The work has shown that "sheep are capable of developing a resistance to the presence of *O. circumcincta*. Adequate nutrition has a great deal to do with this development, and it is suggested that, until an effective drug treatment is found for this worm, more attention should be paid to the food of sheep."

The correlation between the worm-burden and live-weight increase of grazing sheep, A. H. H. Fraser, D. Robertson, and J. E. Ritchie (*Jour. Helminthol., 14 (1936), No. 2, pp. 99, 100*).—The authors find that there is a definitely significant correlation between the worm burden and the live-weight increase of grazing sheep.

The effect of salting pasture on the incidence of stomach worms in sheep, A. H. H. Fraser, D. Robertson, and J. E. Ritchie (*Jour. Helminthol., 14 (1936), No. 2, pp. 101–106*).—By the salting of pasture, infestation of grazing sheep with *Haemonchus contortus* was significantly decreased, but that with *Ostertagia* spp. and *Trichostrongylus axei* was not significantly affected.

Swine erysipelas, L. Van Es and C. B. McGrath (*Nebraska Sta. Res. Bul. 84 (1936), pp. 47, figs. 5*).—This contribution on swine erysipelas, prepared to serve especially as a reference for veterinarians and presented with a list of 102 references to the literature, takes up its etiology, epizootology, clinical manifestations, pathological anatomy, diagnosis, prophylaxis, therapy, and occurrence in animals other than swine and in man.

Culture in vitro of the agent of transmissible leukemia of the fowl [trans. title], J. Verne, C. Oberling, and M. Guérin (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 5, pp. 403–405*).—Experiments conducted have led the authors to conclude that the culture of the causative agent of leukemia of the fowl is very difficult, they having succeeded in only three cases—twice with an 8-day culture and once with a 15-day culture. The fact that the percentage of positive transmissions resulting from reinoculation of the virus has been very low, and never after a period of 15 days, indicates that the virus merely survived and did not reproduce.

Rough Salmonella pullorum variants from chicks, H. C. Gauger (*Jour. Agr. Res. [U. S.], 53 (1936), No. 3, pp. 235–238, pl. 1*).—Studies were made at the North Carolina Experiment Station of two variant strains of *S. pullorum* isolated from baby chicks. These strains varied morphologically and serologically from the normal smooth *S. pullorum* strains usually found in chicks that succumb to the bacteriemic form of *S. pullorum* infection. Both strains exhibited a similar rough colony morphology characterized by two distinct colony types. Antigens prepared from both strains were agglutinated by *S. pullorum* serum and were sensitive to and only partially stable in a saline negative serum mixture.

Age as a factor in the development of resistance of the chicken to the effects of the protozoan parasite Eimeria tenella, C. A. Herrick, G. L. Ott, and C. E. Holmes (*Jour. Parasitol., 22 (1936), No. 3, pp. 264–272, fig. 1*).—In work at the Wisconsin Experiment Station 8 groups of 151 chickens ranging in age from 2 weeks to 15 mo. were infected with the coccidian parasite *E. tenella*. Erythrocyte counts were made before infection and daily thereafter

until the blood count had returned to normal. "From the data presented it seems apparent that (1) chickens of all ages up to and including 15 mo. are susceptible to infection with the parasite *E. tenella* and show symptoms of acute coccidiosis following infection, and (2) chickens infected when 3 mo. old or older are considerably more resistant to the effects of *E. tenella* than are chickens infected when not over 2 mo. old."

A new method for embryonating nematode eggs in fecal discharges, P. P. LEVINE (*Jour. Parasitol., 22 (1936), No. 3, p. 291*).—A description is given of a method of infecting a large number of chickens with nematode eggs devised by the author while working with *Capillaria columbae*.

Further observations on occurrence and incidence of helminths in British partridges, P. A. CLAPHAM (*Jour. Helminthol., 14 (1936), No. 2, pp. 61–68*).—Reporting further (E. S. R., 74, p. 226), *Raillietina cesticillus, Amoebotaenia cuneata*, and *Harmostomum commutatum* are recorded from *Perdix perdix* for the first time. Some remarks are made on the factors influencing infestation with *Trichostrongylus tenuis, Choanotaenia infundibulum*, and *Hymenolepsis phasianina* in the partridge and *H. microps* and *Davainea urogalli* in the grouse.

The occurrence of Molineus patens (Dujardin 1845) in English stoats and weasels, J. W. G. LEIPER (*Jour. Helminthol., 14 (1936), No. 2, pp. 119–126, figs. 4*).—The presence of *M. patens* in England is recorded for the first time.

AGRICULTURAL ENGINEERING

[Irrigation investigations by the Nevada Station], G. HARDMAN (*Nevada Sta. Rpt. 1935, pp. 22, 23*).—The progress results are briefly presented of studies of reclamation of certain desert soils under irrigation from artesian wells in the Las Vegas Valley of southern Nevada, and on tree rings as records of past precipitation.

Effective diameter of well network, W. GARDNER and T. R. COLLIER (*Agr. Engin., 17 (1936), No. 6, p. 240*).—In a brief contribution from the Utah Experiment Station an attempt is made to extend the analysis (E. S. R., 69, p. 437) to a well network of more general character.

Well battery design, W. GARDNER and A. H. PETERSON (*Agr. Engin., 17 (1936), No. 7, pp. 293–295, fig. 1*).—This is a mathematical analysis of the problem of well battery design as developed at the Utah Experiment Station.

Records of wells on the Snake River Plain, southeastern Idaho, H. T. STEARNS, L. CRANDALL, and W. G. STEWARD (*U. S. Geol. Survey, Water-Supply Paper 775 (1936), pp. 139*).—The main purpose of this investigation was to determine as far as possible the direction of movement of the ground water in the Snake River Plain above King Hill and the respective amounts of water contributed to the great underground reservoir by seepage from the Snake River and tributary streams, by precipitation on the plains themselves, and by irrigation water that percolates below the root zone.

The New York State flood of July 1935, H. JOHNSON (*U. S. Geol. Survey, Water-Supply Paper 773–E (1936), pp. IV+233–268, pls. 17, figs. 3*).—This report, prepared in cooperation with the State of New York, presents a description of this flood as a part of the regular stream-gaging work in New York, including much stream discharge data.

Geology and ground-water resources of the Elizabeth City area, North Carolina, S. W. LOHMAN (*U. S. Geol. Survey, Water-Supply Paper 773–A (1936), pp. [4]+57, pls. 4, figs. 5*).—This report, prepared in cooperation with the North Carolina Department of Conservation and Development, describes the geology and ground water resources of parts of Camden and Pasquotank Counties of North Carolina that lie within a radius of about 10 miles of Elizabeth City.

Surface water supply of Hawaii, July 1, 1933, to June 30, 1934 (*U. S. Geol. Survey, Water-Supply Paper 770* (*1936*), *pp. 120*).—This report presents the results of measurements of the flow of streams and ditches in the Territory of Hawaii during the year ended June 30, 1934.

Water resources of the Edwards limestone in the San Antonio area, Texas, P. LIVINGSTON, A. N. SAYRE, and W. N. WHITE (*U. S. Geol. Survey, Water-Supply Paper 773–B* (*1936*), *pp. 57–113, pl. 1, figs. 4*).—This report, prepared in cooperation with the Texas State Board of Water Engineers, deals with the ground water resources of the general area in which San Antonio, Tex., is situated.

Geology and ground-water resources of Uvalde and Medina Counties, Texas, A. N. SAYRE (*U. S. Geol. Survey, Water-Supply Paper 678* (*1936*), *pp. V+146, pls. 11, figs. 3*).—This report, covering the period September 12, 1928–May 25, 1930, is based on an investigation to determine the ground-water resources of Uvalde and Medina Counties and counties to the south especially in relation to irrigation.

Engineering phases of soil erosion control: A symposium (*Agr. Engin., 17* (*1936*), *No. 5, pp. 205–214, figs. 10*).—This symposium contains special articles on Terrace Project Planning, by C. L. Hamilton; Erosion Control in Terrace Outlets, by J. C. Wooley; Lakes in Rural Communities, by L. C. Tschudy; and The Farm Pond, by W. H. McPheters.

A theory of arch action in granular media, R. D. DONER (*Agr. Engin., 17* (*1936*), *No. 7, pp. 299–304, figs. 13*).—This paper, a contribution from the Alabama Experiment Station, sets forth in the form of a theory the mathematically derived laws involved in an explanation of arch action in soils. The cohesive force of moisture films and the coefficient of internal friction or shear between average particles are chosen as the two fundamental properties upon which the theory of dynamics of granular media is based. The development is restricted to internal characteristics and to such boundary phenomena as are independent of the properties of the bounding media.

Derivations are made, in terms of cohesion and shear, of the law of cross pressure, stating (1) the relationship between horizontal and vertical pressures; (2) the law of arch action, giving (a) the angle of arch, and (b) the distribution of pressures in the arch; (3) the general law of compression, giving the volume-pressure relationship; and (4) the law of penetration, indicating a linear relationship between depth of sinking in and load on a plunger, for ordinary ranges and vertical path.

Terraces to save the soil, E. W. LEHMANN and R. C. HAY (*Illinois Sta. Circ. 459* (*1936*), *pp. 31, figs. 24*).—Practical information is presented on the design and construction of terraces for the control of soil erosion in Illinois.

Public Roads, [September 1936] (*U. S. Dept. Agr., Public Roads, 17* (*1936*), *No. 7, pp. 143–174+[1], figs. 34*).—This number of this periodical contains data on the status of the various highway projects receiving Federal funds as of August 31, 1936, and part 4 of an article on The Structural Design of Concrete Pavements, by L. W. Teller and E. C. Sutherland (E. S. R., 74, p. 704).

Recent developments in lumber construction applicable to farm building, F. P. CARTWRIGHT (*Agr. Engin., 17* (*1936*), *No. 7, pp. 291, 292, figs. 3*).—This contribution from the National Lumber Manufacturers Association relates to the increasing use of plywood construction and the possibilities of timber connector construction.

Forest Service offers 2-story plywood panel house, R. F. LUXFORD and A. SMERDA, JR. (*Amer. Builder and Bldg. Age, 58* (*1936*), *No. 8, pp. 51–53, figs. 10*).—In a brief contribution from the U. S. D. A. Forest Service, an experimen-

tal prefabricated house is described in which plywood is the principal material of construction.

Holding power of nails, A. J. Deniston, Jr. (*Agr. Engin., 17 (1936), No. 7, pp. 295, 320*).—In these investigations comparative tests were made of three types of 10-gage nails—screw shank nails, barbed nails, and smooth nails. They were driven 2 in. into blocks of dry, hard pine. Of 8 nails of each kind, 5 were withdrawn soon after having been driven, and 3 were left in the block, exposed to the weather, and withdrawn 76 days later.

The average pull required to remove the 5 screw shank nails in the first test was 400 lb., which is 85 percent more than that required to pull the barbed nails and 34 percent more than that required to pull the smooth nails. The maximum variation in pull between the high and low figures on the drivescrew nail was 25 lb., on the barbed nail 50 lb., and on the smooth nail 100 lb. The high variation in the case of the smooth nail is probably due to the fact that in some cases the fiber of the wood was cut by the points of the nail while in other cases the fibers were pressed apart.

In the second series of tests the average figure for the drivescrew nails was 366⅔ lb., although this is not an acceptable figure inasmuch as weathering split the wood at the points where the nails were driven and their holding power was thereby impaired. Even so, the holding power was far greater than that of the barbed and smooth nails, the increase being 528 and 1,052 percent, respectively.

It is significant that weathering apparently does not decrease the holding power of screw shank nails, although the holding power of barbed and smooth nails is materially decreased by such exposure.

Effectiveness of paints as protective coatings for wood, F. L. Browne (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1936, pp. 41, pls. 8*).—Experiments are reported the purpose of which was to consider not only completed paint jobs consisting of two or three coats of one kind of paint but the effect of priming coats alone and of special priming paints followed by finishing coats of ordinary paint.

Moisture-excluding effectiveness was measured by the Forest Products Laboratory method on 1,344 test specimens of clear heartwood of southern yellow pine, Douglas fir, northern white pine, and redwood, ⅝ by 4 by 8 in. in size with rounded edges and corners. Coatings were applied to all surfaces of the specimens, and moisture movement through the coatings was measured by the gain in weight after transfer from 60 percent humidity to a damp air chamber for 1 week. Nearly all of the primers tested were very low in effectiveness even when the same paint applied in three coats proved very effective. Moreover, there was often no connection between the relative effectiveness of paints as primers alone and their relative effectiveness in two or three coats. As primers alone, the white paints were more effective than the aluminum paints; when, however, the two aluminum primers were covered with two coats of a white paint, such as white lead, the resulting coating was more effective than a 3-coat job with the white paints alone. In other words these aluminum primers, although not particularly effective by themselves, contributed materially to high effectiveness in the completed paint job.

It is considered evident that special primers can be made that will protect wood effectively when used as primers alone and will make good foundations for ordinary paints. Aluminum primer does not meet these dual requirements unless the grade of aluminum powder and the nature of the varnish vehicle are much more closely specified than is now customary. If the vehicle is wisely chosen white primers of high effectiveness can also be obtained, but it

remains to be determined whether such primers will also have the property of retarding the flaking of paint coatings from conspicuous bands of summerwood that is the principal merit of good aluminum primers for wood.

In general, each successive coat of paint applied improved the effectiveness of the coating against moisture movement, but the increments attributable to each of the successive coats are very unequal. One of the coats, usually the second, seems to achieve the major portion of the final effectiveness.

All specimens representing complete paint jobs were exposed to the weather at 45° facing south at Madison, Wis., and tested for effectiveness and inspected for integrity of the coating at intervals of 6 mo. At the end of 36 mo. the coatings on the backs of nearly all specimens were still glossy, free from fissures, intact, and similar in appearance to young coatings, except that many of the white paints were distinctly yellow, as would be expected from repeated exposure to 97 percent humidity without subsequent exposure to direct sunlight. It is therefore considered reasonable to suppose that the effectiveness of the coatings on the backs of the specimens remained approximately the same as it was initially. If that assumption is correct the changes in effectiveness of the exposed faces were just twice the changes recorded, and the effectiveness of the exposed face of a specimen at any time E'_T can be computed from the formula $E'_T = 2\,E_T - E_O$, where E_T and E_O are the ratings for T months and O months, respectively.

In general, the effectiveness of paints against moisture movement increased during the first few months of exposure to the weather. Nearly all of the coatings tested were more effective at age 6 mo. than they were before exposure. Some paints remain near their maximum effectiveness for many months, while others soon pass through the maximum and decrease steadily in effectiveness thereafter. Of the two control paints, white lead in linseed oil declined steadily in effectiveness after its maximum at 6 mo., while white lead in Bakelite paint oil was almost as effective after 36 mo. as it was at the beginning. Chalking, checking, and cracking of paint coatings clearly determine which of these two types of behavior shall prevail, but the significant feature of chalking and checking in this connection is not the age at which they first appear but the rate at which they penetrate through the coating.

As priming coats under white lead paint in place of conventional priming, all of the aluminum paints improved both the initial and the maximum effectiveness during subsequent exposure that is characteristic of white lead paint when used for all three coats. From the point of view of protection this long maintenance of effectiveness is more important than increased initial effectiveness. Aluminum in the paste form proved as effective as dry aluminum powder of standard varnish grade when substituted pound for pound in the same vehicles.

Two vehicles, shellac plasticized with castor oil and a nitrocellulose lacquer, proved lacking in durability either as primers for white lead paint or as complete paints, but all other vehicles tested made aluminum primers that greatly improved the maintenance of effectiveness throughout the life of white lead paint, and all left coatings which were more effective after 36 mo. than were many good paints initially. Among the satisfactory aluminum primers, however, some proved more successful than others in prolonging the life of the coating on southern yellow pine and Douglas fir.

Kettle-bodied linseed oil made a very satisfactory aluminum primer. As complete paint coatings, all of the satisfactory aluminum paints proved outstandingly durable both in maintenance of integrity of the coatings on all woods and in maintenance of effectiveness against moisture movement.

In initial and maximum effectiveness all paints that contained either white lead or zinc oxide were slightly superior to any paints that contained neither white lead nor zinc oxide. As complete paint coatings, the colored-pigment paints, except red lead, proved lower in initial and maximum effectiveness than the paints that contained white lead or zinc oxide and approximately equal to white paints containing neither white lead nor zinc oxide. Red lead increased in effectiveness up to the eighteenth month, after which its effectiveness decreased rapidly. The litharge paint rapidly lost effectiveness after age 6 mo.

The two chrome yellow paints remained as effective after 36 mo. as they were initially. Other colored-pigment paints were less effective than white lead paint at the beginning, but they were as effective or a little more effective at the end of 36 mo. In maintenance of the integrity of the coatings all of the colored-pigment paints, except red lead paint, were more durable than any of the white paints, and on the whole the colored-pigment paints took longer to develop chalking. The colored-pigment paints, except red lead and litharge paints, developed neither checking nor sigmoid cracking during the test.

As vehicles for all three coats of paint the Bakelite paint oil was superior on the whole to either of the ester gum varnishes when pigmented with white lead, iron oxide, or asbestine. The 75-gal. ester gum varnish was more satisfactory than the 33-gal. varnish when pigmented with white lead or iron oxide, but not when pigmented with asbestine. Although all three paints made with asbestine were comparatively short-lived (and were transparent), in each case they were more effective and more durable than the corresponding clear vehicles without pigmentation.

Comparison of the results of application by spray gun with the results of brush application of similar paints in other series revealed no significant differences attributable to the method of application.

Paints as protective coatings for wood, F. L. Browne (*Indus. and Engin. Chem., 28 (1936), No. 22, pp. 798–809, figs. 7*).—This brief statement includes information supplementing a previous report[3] and constituting with it the article noted above.

Observations on the use of the high speed wind-driven propeller for generating low voltage electricity, W. H. Sheldon (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 6–12, figs. 2*).—It was found that the successful operation of any wind-driven battery charger depends largely upon a good exposure to the wind and the ability of the propeller to absorb energy from winds of from 8- to 12-miles-per-hour velocity.

Propellers with a very high tip speed ratio revolved with less speed than those with a 9:1 ratio, thereby defeating the purpose of the higher tip speed ratio. A propeller with four blades generated about 50 percent more current than a 2-blade propeller using the same wind stream.

The length of a propeller for direct drive used with the lower speed generator was found to be limited to 5 ft. in 8- to 10-miles-per-hour winds. Rewinding the generator to start charging at 200 r. p. m. would make possible the use of a 7-ft. propeller for direct drive use, and this propeller should absorb twice as much energy from the wind as a 5-ft. propeller.

Commercial aspects of electro-horticulture, J. Cooper (*Rural Electrif. and Electro-Farming, 12 (1936), No. 136, pp. 66–68, figs. 5*).—This paper deals briefly with irradiation of plants and soil heating, with particular reference to their commercial aspects. Both practices are considered to be a success in England.

[3] Indus. and Engin. Chem., 25 (1933), No. 26, pp. 835–842, figs. 2.

Fencing with electricity, E. W. Lehmann (*Successful Farming, 34 (1936), No. 8, pp. 22, 32, fig. 1*).—In a brief contribution from the Illinois Experiment Station, practical experience in the use of electrical fencing is described.

1935 tractor costs in Michigan, K. T. Wright (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 21–23*).—Data are given on the costs of operating 41 tractors in Michigan in 1935, including all cash expenses of operation such as fuel, lubricants, repairs, labor for care, fixed costs of depreciation, interest on tractor value, and charge for shelter.

Laying out fields for tractor plowing, C. D. Kinsman and L. A. Reynoldson, rev. by A. H. Glaves (*U. S. Dept. Agr., Farmers' Bul. 1045, rev. (1936), pp. [2]+18, figs. 15*).—This revision (E. S. R., 41, p. 289), briefly describes the more common methods recommended by farmers who use tractors for plowing.

Machine placement of fertilizers for snap beans in Florida, G. A. Cumings, A. L. Sharp, J. J. Skinner, G. M. Bahrt, and G. H. Serviss (*U. S. Dept. Agr. Circ. 399 (1936), pp. 43, figs. 20*).—This report presents the results of studies conducted cooperatively by the Bureaus of Agricultural Engineering and Plant Industry.

Ten fertilizer placement experiments with snap beans were conducted on Leon fine sand and St. John's fine sand near Winter Garden, Fla., in 1931, 1932, and 1933. Three fertilizers were used in the placement experiments. Two of these contained 5 percent of ammonia, 7 percent of phosphoric acid, and 5 percent of potash, and one contained twice the amount of these fertilizer constituents. One of the 5–7–5 fertilizers contained only inorganic nitrogen and the other contained nitrogen one-half from inorganic and one-half from organic sources.

Fertilizers placed in 3.5-in. bands on the surface of the ground over the seed, mixed with the soil under the seed, or placed in bands 1.75 and 3.5 in. wide 1 in. under the seed materially delayed germination and reduced the final stand of plants under normal rainfall conditions. Fertilizers placed on the surface of the soil injured the young seedlings as they emerged.

Fertilizer placed in bands 2 or 4 in. to one or both sides of the seed row 1.5 in. below the level of the seed, and 1.75- or 3.5-in. bands 3 in. under the seed, stimulated germination and plant growth sufficiently to give a final stand of plants superior to and larger than those of plants unfertilized at time of planting.

Effective rainfall immediately following planting reduced adverse effects on germination of placements under the seed, but intensified injurious effects of the placement over the seed. Lack of rainfall during the germination period intensified the adverse effects of placements under the seed. Material delay of germination and injury to stand was reflected in plant growth and yield.

Earliest germination, best stands, and most rapid growth of plants, and earliest maturity and highest yields of green beans, both at the first picking and total, were obtained with fertilizer placements in a band 3 in. under the seed, and in a narrow band 2 in. to each side of the seed row 1.5 in. below the level of the seed. The yields at first picking were slightly higher and the total yields slightly lower for the side placement.

Lower efficiency of the fertilizer as indicated by yields resulted from the placements 4 in. to the sides of the seed row, mixed in the surface soil of the seed row, and application 1 week after planting.

The three fertilizers used, in general, gave about the same relative result from various comparable placements. The 10–14–10 fertilizer and the 5–7–5 fertilizer that contained nitrogen equally from inorganic and organic sources were slightly inferior to fertilizer 5–7–5 containing only inorganic nitrogen, when placed in the most favorable positions with respect to the seed.

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In obtaining the two most advantageous placements, namely, 3 in. under the seed, and 2 in. to each side of the seed row, the latter was found the more practical with respect to machine operating difficulties resulting from draft and from vegetation previously plowed under.

The two-row cultivator converted into a weed control machine, D. E. WIANT and R. L. PATTY (*South Dakota Sta. Bul. 303 (1936), pp. 8, figs. 7*).—It is pointed out that the two-row cultivator can be converted easily and quickly into a weed control machine, satisfactory both for weed control or summer fallowing. The type which lends itself best to this conversion is the shovel type horse-drawn cultivator. Practical information is given on the manner of making this conversion most satisfactorily.

Harvesting native grass seed, G. C. FULLER (*Agr. Engin., 17 (1936), No. 5, pp. 195–197, figs. 2*).—In this contribution from the U. S. D. A. Soil Conservation Service an account is given of experience in the harvesting of native grass seed with different machines.

It was found that ordinary farm machinery may be used for harvesting seed of most native grasses. The new power stripper has many advantages over the horse-drawn machine, principally because of its flexibility and amount of ground covered. Buffalo grass seed may be secured with a vacuum machine. Machines of this design will harvest from 50 to 60 percent of the seed under average conditions and will not damage the pastures. For best results, pastures moderately to heavily grazed must be selected from which to harvest seed. A chain drag used on pastures of this nature will slightly increase the amount of seed obtained. Mowing pastures will not be feasible because of added expense and lack of available pastures where mowing would be permitted even at rental prices. The efficiency of the machine will be determined by the density of the turf and how securely the seeds are imbedded in the soil. Because of the demands for buffalo grass seed, the amount of money and time involved in perfecting these machines to a point of more than 50 percent efficiency has been worth while.

Pyrethrum harvesting (*Agr. Engin., 17 (1936), No. 7, p. 284, fig. 1*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering the results of experiments on the development of a machine to harvest pyrethrum are reported. Some success was obtained with a modified cotton stripper from which the teeth on the stripping rollers were removed and angle iron strips were fastened to the rollers. These angle irons proved much more satisfactory than the teeth.

Potato washing investigations, C. L. VINCENT and H. L. GARVER (*Washington Sta. Bul. 332 (1936), pp. 24, figs. 7*).—Different commerial potato washers are described, and an experimental washer is described and illustrated and the results of experiments with it briefly presented.

The results indicate that washed potatoes stood up in storage as well as unwashed potatoes, and that decay was greater at higher temperatures than at lower temperatures. Dry rot was particularly prevalent in potatoes in common storage.

The types of commercial washers investigated involved the spray, flood or splash, and abrasive principles of washing. The spray type of washer was the simplest of all the washers tested and consisted mainly of two pipes, each containing three rows of small holes, one placed above and the other below a conveyor belt.

The flood or splash type of washer works on the principle of recirculating the water in a tank and pumping it from the tank to a flood rack above a conveyor. Fresh water is added constantly to replace that carried off on the

potatoes. In addition there may be some abrasive action, depending upon whether or not brushes are used in the cleaning process.

The abrasive washer consisted of a small hopper, a rigid bar type of conveyor, and a rotating cylinder. The cylinder is lined with coconut husk door mats and rotated at a peripheral speed of approximately 135 ft. per minute (inside diameter).

The capacities of these machines varied from 1 to 5 tons per hour, and the power requirements were from 1.5 to 5 hp. The quantity of water required varied according to the machine, but was approximately 1,000 gal. of water per ton of potatoes.

The experimental washer was built on a soak-rinse principle. It consisted in general of a soak tank, a conveyor made of a flexible metal chain link conveyor 18 in. wide with a 1.25-in. mesh, and a rinse. The capacity of this washer is approximately 1.5 tons of potatoes per hour, about one-half as large as those found in commercial operation. If run at such a speed as to require approximately 1.25 min. for the potatoes to pass through the water, washing is satisfactory.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 182 (1936), pp. 118–122*).—The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 75, p. 709) is brought down through July 1936, and an article by G. F. Henning and P. S. Eckert on Farmers' Attitudes Toward Livestock Auctions is included (pp. 118–121). This article is based on data obtained from a questionnaire answered by 283 farmers throughout the State and other studies made in the Columbus, Cleveland, and Cincinnati areas and Pickaway and Auglaize Counties. The opinions as to the satisfactoriness of auctions, comparative prices received at auctions and net prices at terminals, and the advantages and disadvantages of livestock auctions are tabulated and discussed.

Types of farming in Arkansas (*Ark. Agr. Col. Ext. Circ. 351 (1936), pp. 76, figs. 7*).—The State is divided into 12 areas on the basis of types of farming. The climate, soils, soil erosion, land use and crops, and types of farms are described for each area, and recommendations made for improvements in the farming systems.

Hawaii: A pageant of the soil, J. Hobbs (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, [1935], pp. XVII+185*).—This is a study of the past and present land tenure in Hawaii. It includes information pertaining to the economic and social developments that have taken place in the islands. The material is presented in chapters on land customs in early Hawaii, revolutionizing the land system, aftermath of the Mahele [division], lands acquired by westerners, and land in the modern economic setting. A bibliography and appendixes giving brief biographies of American missionaries to Hawaii and land transactions of the missionaries are included.

Maine agriculture in 1935: A statistical presentation, C. H. Merchant (*Maine Sta. Bul. 382 (1936), pp. 147–295, figs. 21, map 1*).—The data obtained in the 1935 Federal Agricultural Census as regards number, acreage, and value of farms, acreage and production of different crops, number of different kinds of livestock, production of livestock products, etc., are tabulated by towns (townships). Other tables show the number, acreage, and value of farms, acreage of principal crops, number of livestock on farms, average yields per farm of principal crops, and average number of different kinds of livestock per farm as reported in the Federal censuses, 1880–1935 (also 1850–70 for number, acreage,

and value of farms and number of livestock on farms). Index numbers are also shown for the acreages of crops and number of livestock. Part of the data from the 1935 census is also presented on maps and in graphs.

Land utilization and farm development studies, F. B. HEADLEY (*Nevada Sta. Rpt. 1935, pp. 23–25*).—Tables show the net worth of farmers at the beginning of 1934 and 1935 and the expenses, credits, and balance available for living, interest, and principal in 1934 on 7 Carson Valley, 9 White Pine, and 9 Newlands reclamation project representative farms.

[Semiannual indexes of farm real estate values in Ohio, July 1, 1935, to June 30, 1936], H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Buls. 88 (1936), pp. 8, fig. 1; 94 (1936), pp. 4*).—These bulletins continue the series previously noted (E. S. R., 74, p. 714). No. 88 covers the period July 1 to December 31, 1935, and No. 94 the period January 1 to June 30, 1936.

The estimated gross cash income from the sale of agricultural products from Ohio farms by counties, 1933, 1934, and 1935, P. P. WALLRABENSTEIN and J. I. FALCONER (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 93 (1936), pp. [1]+26*).—This mimeographed bulletin continues the series previously noted (E. S. R., 70, p. 551). Tables are included showing for each year and for each county and district of the State (1) the gross agricultural cash income—total per county and average per farm and per acre—and the percentages contributed by the six most important enterprises and (2) the income from sales and from rental and benefit payments under the Agricultural Adjustment Administration programs.

***Public finance problems in the Zaleski Forest and rehabilitation project* of the Resettlement Administration,** J. F. DOWLER and H. R. MOORE (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 92 (1936), pp. [2]+20*).—Within a purchase area including 45,957 acres (17.09 percent of the total area of the county) in 5 townships in Vinton County, Ohio, it is estimated that the Resettlement Administration will purchase approximately 21,000 acres on which about 74 families reside. This study was made to determine what changes in local public finance would be brought about by the conversion of such an area from private to public ownership. The valuations of different types of property, tax delinquencies, etc., in the county, the 5 townships, and the purchasable area in the townships; the probable extent of purchases; and the effect of the probable purchases on county, township, and school revenues, road finances, bonded debt, poor relief, etc., are discussed.

Relocation of non-conforming land users of the zoned counties in Wisconsin, G. S. WEHRWEIN and J. A. BAKER (*Jour. Land and Pub. Util. Econ., 12 (1936), No. 3, pp. 248–255*).—Using the information obtained from the official lists of nonconforming land users in 22 northern and north-central counties with zoning ordinances and data on 615 Civil Works Administration schedules obtained as part of a study of isolated settlers in northern Wisconsin, the problems of isolation are discussed and a priority suggested in the purchase of submarginal farms in land retirement programs.

Town taxation [in Vermont] (*Vermont Sta. Bul. 407 (1936), p. 16*).—The percentages of income received from major sources and of expenditures by major town functions in 50 towns studied are reported.

Agricultural credit, A. I. QURESHI (*London: Isaac Pitman & Sons, 1936, pp. XVII+190*).—This volume deals with the recent developments in agricultural credit administration in the United States and was published for the purposes of serving as a textbook on agricultural credit and of presenting "the American situation as it is, to British statesmen and students, in the hope that we shall

learn from American experience—avoiding their mistakes and benefiting from their good points—and evolve a sound system of agricultural credit in the countries of the British Empire. This is the main reason why so much stress has been laid on the administrative side of the problem."

The agricultural credit situation in the United States prior to 1916 is described, and the Federal Farm Loan system, the War Finance Corporation, the Federal Intermediate Credit system, the Federal Farm Board, the Reconstruction Finance Corporation, and the Federal Farm Credit Administration are discussed.

The introduction is by J. Johnston.

Motor truck transportation in relation to cooperative fruit and vegetable marketing in Michigan, G. N. Motts (*Michigan Sta. Quart. Bul., 19 (1936), No. 1, pp. 36–44*).—A summary is presented of data on the development of truck transportation in connection with cooperative fruit and vegetable marketing in Michigan.

Wheat requirements in Europe (especially pertaining to quality and type, and to milling and baking practices), J. H. Shollenberger (*U. S. Dept. Agr., Tech. Bul. 535 (1936), pp. 191, figs. 24*).—This bulletin is chiefly concerned with the presentation of information pertaining to quality and type of wheat and to milling and baking practices. The descriptive information is based largely on field investigations made in Europe by the author during the period from June 1931 to June 1934. The concern of the United States in European wheat requirements is described, and the requirement situation for Europe as a whole is described and discussed under the following headings: General characteristics of European wheats, general milling practices, type and quality of wheat required for European trade, history and present status of European bread consumption, the breads of Europe, certain economic factors affecting the European wheat-requirement situation, European bread-grain production, and government regulations affecting the wheat-requirement situation. This is followed by a description and discussion of the requirement situation in 14 individual countries, including data as to milling and baking practices and dietary habits.

Among the author's conclusions are that from the standpoint of long-time trends, wheat will some day be the principal and predominating grain for bread production in practically all European countries. Wheat production in most western and central European countries has increased beyond the upper limits of the market requirements for the kind and quality of wheat grown, and a deterioration in the quality of common breads has resulted. With improvement of economic conditions or in the political situation there will be a tendency in some countries to decrease wheat production due to domestic production being of a lower quality than desirable for bread-baking purposes. Because of climatic conditions it is doubtful whether western European countries can ever reach a self-sufficiency status as regards quality. In nearly all European countries the consumption of bread is declining and in many the extent of the decline in future years is likely to be considerable. Increases in bread consumption are likely to occur only in one or two sections where living standards at present are little above the starvation basis. Quality requirements for foreign wheat in European markets will tend toward higher levels in the future.

"Most of the countries have sufficient or more than sufficient milling capacity for domestic needs. The governments of the few nonself-sufficient countries, through discriminatory measures against imports of flour and by encouragement and assistance given to home industry, are rapidly increasing their respective capacities to the point that in the near future the import demand for flour will be practically negligible.

"The long-time demand outlook for hard red winter wheat, the principal type exported from the United States in the past, will be favorable, providing its price is lowered to that of wheats of similar quality from other exporting countries. Although the import demand for bread wheats, in recent years, has been considerably reduced by the milling restrictions placed on the use of foreign wheat in many of the leading wheat-importing countries, the reduction in demand has been chiefly for the soft types of wheat. Wherever there is a market for bread wheats, hard red winter, because of its desirable milling and baking qualities, will be given favorable consideration along with Canadian and Argentine wheats, provided it is offered at a somewhat similar price.

"The demand outlook for United States Pacific Northwest white wheat is not very promising. Only in the Irish Free State is white wheat especially desired; the other European countries have little real need for it. If the United States is to find a foreign market for this type of wheat, it will probably have to look to the Orient.

"The demand outlook for durum wheat offers possibilities not enjoyed by other types, for it is produced in only three or four of the countries but is needed in all of them for the production of semolina alimentary pastes. The demand for this wheat, although not great, should continue to be steady."

Competition between linseed and other drying oils, with particular reference to California, E. W. GROVE and D. W. SMYTHE (*California Sta. Mimeogr. Rpt. 52 (1936), pp. [1]+32, figs. 5*).—Data are included and discussed regarding the changes and trends in the production and consumption of flaxseed in the United States and the net imports, prices, consumption, etc., of linseed, tung, perilla, hempseed, soybean, oiticica, and other vegetable and fish oils. The uses for the various drying oils and the competition with linseed oil and the effects of the Bailey amendment to the Revenue Act of 1936 are also discussed.

Economics of the production and marketing of apples in New Mexico, P. W. COCKERILL and R. P. CALLAWAY (*New Mexico Sta. Bul. 242 (1936), pp. 74, figs. 13*).—The apple producing areas of the State are described, as well as the past and prospective trends of apple production in the State and the United States, the trends in the production of competitive fruits, exports of apples from the United States, and the prices and purchasing power of apples. Using records of production requirements and costs obtained by visits each fall, 1930–34, from an average of 85 producers in the 8 commercial producing areas of the State, data are presented and discussed showing the average man labor and horse work requirements, and frequency of different production operations, costs of materials, machinery costs, investment, seasonal distribution of man labor, and costs of production per acre in each commercial area. The volume of, outlets for, and destinations of New Mexico apples transported by truck, the cost of preparing apples for market, and the prices received for different varieties are discussed, and data are presented for each commercial area as to prices received and costs incurred with different methods of preparing apples for market and the gross and net returns and costs in producing and marketing apples.

The apple industry in New Mexico expanded rapidly from 1890 to 1910, but since 1920 the total number of trees has declined. From 1920 to 1935 the trend of total apple production was slightly upward but that of commercial production was downward and may continue downward for some time, although there are indications that commercial production may increase in a few areas. From 1925 to 1935 the prices received by New Mexico apple producers averaged above United States prices and the prices in the principal competing States.

"Data point to the fact that at the present rate of tree plantings, apple production in New Mexico will continue to decline. The market outlook for the

crop in this State indicates that the production should be stabilized at a point which will economically supply nearby deficit areas. This production should be localized in areas with physical conditions that are favorable to low costs of production and high quality of fruit."

The livestock auction in Ohio from the farmers' point of view in 1934 and 1935, G. F. HENNING and P. S. ECKERT (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 89 (1936), pp [1]+13*).—This study of the livestock farmers' attitude toward livestock auctions is based on 283 replies to a questionnaire sent out in October 1935 to the 462 farmers previously noted (E. S. R., 74, p. 717). An analysis is also made of data secured in interviews with 122 farmers in 4 counties in southern Ohio who were or had been patrons of the Producers Livestock Commission Association of Cincinnati and of whom 89 percent had livestock auctions available in their communities.

Analysis of the Dayton livestock price situation, G. F. HENNING and P. S. ECKERT (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 90 (1936), pp. [1]+7, figs. 6*).—Tables and charts are included and discussed showing for the years 1930–35 the price differential between Dayton and Cincinnati for three weight groups of hogs, top lambs, and top veal calves.

Supplementary report on the Los Angeles milk market, J. M. TINLEY (*California Sta. Mimeogr. Rpt. 51 (1936), pp. 3*).—This report supplements the one previously noted (E. S. R., 75, p. 711) by discussing the effects on the buying price of milk economically justified in the Los Angeles market of several significant changes after April 1936 in the prices of butter and feed, farm wages, and in manufacturing and grade A milk in Tulare County.

Prices of farm products in New York State, 1841 to 1935, S. E. RONK (*[New York] Cornell Sta. Bul. 643 (1936), pp. 76, figs. 11*).—The chief purpose of this study was to extend back so far as possible the series of farm prices of important farm products which have been collected monthly by the U. S. Department of Agriculture since 1908 for crops and since 1910 for livestock. The chief sources of information were local market reports quoted in newspapers or agricultural journals, account books of farmers and dealers, mill records, etc. In making the study the State was divided into nine districts corresponding as nearly as possible to different types of farming and agricultural conditions in the State.

Tables are included showing so far as available for the period 1841–1935 (1) the monthly prices received by producers for wheat, corn, oats, rye, barley, buckwheat, apples, beans, potatoes, hay, dressed beef, beef cattle, dressed pork, hogs, dressed mutton, sheep, dressed lambs, lambs, dressed veal, veal calves, wool, milk, butter, dressed chickens, chickens, and eggs; (2) annual index numbers of the prices of individual products and groups of products; and (3) monthly index numbers of farm prices received by producers using variable group weights. Other tables present data regarding prices paid by farmers for certain commodities, group weightings used, etc.

Since 1841 changes in New York farm prices were found to parallel closely the movements of wholesale prices of farm products in the United States, and in general to follow trends similar to those of farm prices in Maryland and Virginia. "During the past 95 yr. the exchange ratio of farm products in New York to all commodities at wholesale in the United States has been above 100 for 11 yr. Five of these years were from 1926 to 1930. Grains, in terms of other commodities, have definitely declined since 1855. The purchasing power of fruits and vegetables has fluctuated over wide limits. The trend has been constantly upward during the period covered by this study. Fruits and vegetables have been relatively high in price since the Civil War period.

The purchasing power of hay rose until the middle of the nineties, and since then it has declined. Livestock and its products increased in value in terms of other commodities until the outbreak of the World War and declined following that time. The trend in the purchasing power of the dairy group has been upward throughout the entire period studied but at a somewhat less rapid rate since the middle of the nineties. It was not until after 1910 that the poultry group reached its pre-war level. In terms of other commodities, the poultry group rose during the entire period included in this study. There appears to be a cycle in the purchasing power of chickens and eggs, averaging about 17 yr. in length, accompanied by a secondary cycle a little more than 8 yr. in duration.

"For all practical purposes it made no difference whether acreage or production figures were used as weights in the construction of average prices for the State. In the early years the variable group weightings gave results above the index with constant group weightings. This is because the weights of the low-priced groups were reduced. For the period from 1910 to 1933 there was little difference between the index numbers of either grains or fruits and vegetables constructed with constant base weights and the corresponding index numbers constructed with monthly base weights."

Annual index numbers of farm prices, farm crop production, farm wages, estimated value per acre of farm real estate, and farm real estate taxes, California, 1910–1935, H. J. Stover (*California Sta. Mimeogr. Rpt. 50 (1936), pp. 47, figs. 12*).—The index numbers of farm prices previously noted (E. S. R., 71, p. 415) are revised and brought down through the year ended June 1936. The revision was due to revisions in some of the data used in the construction of the previous series and to a few minor changes in methodology, both of which are discussed. Included in addition are (1) annual index numbers of farm crop production in California, 1910–11 to 1935–36, based on the same crops used in the construction of the annual index numbers of farm prices; (2) annual index numbers of farm wages in California, 1910–35; (3) annual index numbers, 1912–36, of the estimated value of farm real estate in California as of March 1; and (4) annual index numbers, 1913–34, of farm real estate taxes per acre and per $100 of value.

International yearbook of agricultural legislation, 1935 [trans. title] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr., 25 (1935), pp. LXXVII+925*).—This volume continues the series previously noted (E. S. R., 74, p. 871).

RURAL SOCIOLOGY

***Forms and problems of culture-integration and methods of their study.*—II, Logico-meaningful integration of culture and methods of its study,** P. A. Sorokin (*Rural Sociol., 1 (1936), No. 3, pp. 344–374*).—This is a continuation of a previous discussion on this subject (E. S. R., 75, p. 714).

Rural educational institutions and social lag, R. R. Renne (*Rural Sociol., 1 (1936), No. 3, pp. 306–321*).—"Our ability to regulate and improve human relations has failed to keep pace with our ability to utilize inanimate substances and energies. This lagging of the societal arts behind technical progress has caused much human suffering and misery. The causes of this social lag are numerous and complex, but it cannot be denied that the administrative and financial organization within which our institutions operate is a very important factor contributing to increase or decrease this lag. . . .

"One of the main reasons why rural teachers are not so well trained or experienced as city and town teachers is that many of the small, poor rural districts cannot pay the salaries which the larger, more thickly populated and wealthy districts can and do pay. The average salary paid school teachers in

the United States during the year 1933–34 was $1,050, and the average paid city teachers was $1,416, while that paid rural teachers was $750."

Conditions in Montana previously noted (E. S. R., 74, p. 874) are cited to illustrate "the inequalities in school burdens which may result from a combination of extreme decentralization of administration and a heavy reliance on local taxes. . . .

"It is a widely observed fact that during the present depression, when governmental spending has been increasingly heavy and has been offered as a means of pulling us out of the slough, spending for schools has been seriously curtailed. . . .

"This whole problem of financial support of our educational institutions is, then, a matter of primary versus secondary group relationships carried into the field of public finance. Unless and until more of our school revenue is secured through indirect or secondary group means, the financial support of our educational institutions will lag behind that for many other less essential public services, with resulting serious social consequences. This will be particularly true in rural communities where the means of support is peculiarly direct and personal, and where a combination of factors noted above already makes it difficult to maintain educational opportunities comparable with those available in the more highly industrialized and urban areas. . . .

"The process of adaptation of our school system to our present modern environment is far from complete. . . . It is vital that the adaptive process suggested be speeded up, so that the five principal shortcomings resulting from the time lag in adjustments in the administrative and financial machinery of our schools be eliminated or their undesirable social consequences reduced to a minimum. Not until this lag is reduced appreciably can we expect our schools, particularly in rural and less industrialized areas, to train our children adequately so they can orient themselves satisfactorily in our modern environment, much less to perform the leadership our educational institutions should perform in pointing toward, and assisting in securing, a better social order."

Real and apparent exceptions to the uniformity of a lower natural increase of the upper classes, C. Gini (*Rural Sociol., 1 (1936), No. 3, pp. 257–280*).—The author "shows how multiple circumstances, some permanent, others saltatory or occasional, intervene to modify from place to place and from time to time the differences in increase of the various classes. In spite of these, one may speak of a norm in the sense that, in our social organization, the increase is generally less for the upper social classes, but it is difficult to establish what the normal intensity of such differences would be if there were no special causes of modification."

The future population in the agricultural industry in the State of Illinois, D. E. Lindstrom (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 141, 142*).—The population living in unincorporated places and in the open country in Illinois declined steadily in the 40-yr. period, 1890–1930, from 1,630,690 to 1,343,659 people. The number of people actually living on farms in 1930 was 999,391. There was also a decrease from 262,953 to 235,974 families on farms in this 40-yr. period, but the decrease was not steady for there was an increase in the decades 1890–1900 and 1910–20. There was an increase in families per farm, for the number of farms decreased about 20 percent in 1910–30. The migration to farms occurred in areas near urban and industrial centers, in general was to the poorer lands, and may be reversed when economic conditions improve in the urban centers. Present indications are that the State may, however, have more people on the land in the next 10 yr. than in the past 10 yr. The cities are interested in moving their unemployed to the land in order to reduce the relief burden in the cities. There is also an effort to

move families off so-called submarginal land which is being purchased for forest and pasture uses by governmental and other agencies. If there is to be an increase in the number of people on farms in the State over the next quarter century, this increase probably will not be in the number of commercial farmers but rather in the number of those who operate so-called family-size farms, part-time farms, or subsistence farms.

Rural population trends in Washington, P. H. Landis (*Washington Sta. Bul. 333 (1936), pp. 64, figs. 44*).—The author analyzes the general trends in number and distribution of population, its composition, family characteristics, occupations and employment, educational characteristics, and implications of the State's population trends.

"The State in the future must depend largely upon immigration for population increase if birth rates continue to decline and death rates increase as they are expected to do. . . . There is a definite need for careful analysis of the economic opportunities of areas in which immigrants contemplate settlement. . . .

"Data on occupations indicate very clearly that agriculture has declined in importance as a vocational outlet. Only approximately 20 percent of the population of this State is now engaged in agricultural pursuits. The idea that all farm youth should be prepared to return to the farm is definitely outmoded. Many of the youth will leave the farm when they reach productive ages of life and contribute their share to the energy of the great cities. This is inevitable under existing conditions in social organization, for the rural birth rate is higher than the demand for agricultural workers. Schools training rural youth should, therefore, not only train for agriculture but for vocational outlets in urban life. It is perfectly reasonable, also, to assume that educational opportunities should be equalized throughout the State, even though part of the expense should fall on urban areas, for the city has been getting, and doubtless will continue to get, a share of youth trained in rural communities."

Social attitudes of the Czechoslovakian peasant towards the other occupational groups, A. Obrdlik (*Rural Sociol., 1 (1936), No. 3, pp. 296–305*).—The Czechoslovak peasant places his own occupation first most often. "He is proud of it because he realizes the importance of his work for the welfare of the whole nation. He values the work of laborers and artisans next and thinks highly of the teacher as well as certain other occupations." A questionnaire sent out to 74 peasants indicated that some of the individuals were prejudiced against some occupations or at least had doubts as to their general usefulness.

Historical background of California farm labor, P. S. Taylor and T. Vasey (*Rural Sociol., 1 (1936), No. 3, pp 281–295, figs. 5*).—"During less than a century of agricultural history, the rural work of California has been performed successively by ranch hands, by farm hands, and by semi-industrialized proletarians. Today the latter dominate the rural scene—numerous, mobile, and racially varied to a degree beyond the agricultural laborers of all other States." The authors examine the historical trends which underlie these changes.

"The use of alien workers on California farms has markedly complicated the adjustment of economic and human relations in agriculture."

Rural emergency relief in Washington, with attention to characteristics of rural relief households, P. H. Landis, M. Pritchard, and M. Brooks (*Washington Sta. Bul. 334 (1936), pp. 39, figs. 18*).—The authors summarize the emergency relief trends in the State and preliminary data making a comparison of relief with nonrelief farm laborers in the Yakima Valley and present an analysis of relief data dealing with characteristics of relief households obtained in five rural counties.

Emergency relief has supplemented the income of or provided for as many as 224,793 people per month in the State during the depression years of the

thirties. As much as $2,196,606 per month has been expended for those requiring aid from public funds. The State has depended on the Nation more than the average State for revenue for relief expenditures.

"The Civil Works Administration exceeded all programs in the monthly amounts of money expended. The Emergency Relief Administration program has exceeded all programs in the number of people aided. The tendency in relief loads was to increase up to January 1935, after which time the national trend declined. The State load declined after February 1935." While the Civil Works Administration reduced relief expenditures during the period of operation, immediately upon its termination relief loads increased rapidly.

"Information concerning the first period of relief assistance indicates that approximately 50 percent of the relief clients in the sample studied were on relief for the first time in 1935, although nearly one-third came on relief in 1933. . . .

"The number of those classed as farm laborers seems especially high, as does also the number of unskilled workers in the nonagricultural group. . . . Data on age groups within relief households indicate clearly that they have a much larger proportion of members in the dependent years of life, 15 yr. of age or under. . . . Ninety percent of the relief households had, during the period of the study, one or more people willing and able to work. Less than 10 percent had no members who would have been employable had opportunities for work been offered."

Compared to nonrelief households, relief families are more mobile. "They are nearer the economic margin, having less income per year and fewer days' labor. This holds true for single workers as well as for families. They have larger family responsibilities."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The professional movement of rural school teachers in Pennsylvania, W. F. Hall (*Pennsylvania Sta. Bul. 332 (1936), pp. 64, fig. 1*).—This research was undertaken in an attempt to arrive at scientific knowledge of rural teacher mobility. Fifteen Pennsylvania counties, fairly representative of the whole State, were selected for the study. The data were collected by use of a questionnaire, and the analysis is based on 2,118 answers and applies to the school years 1923–24 to 1929–30. The teacher records were sorted according to the following categories: "(1) Teacher of the one-room school, grades 1–8, three graded-elementary-school-teacher categories; (2) grades 1–3; (3) grades 4–6; (4) grades 7–8; (5) high school teacher, grades 9–12." The classes of school districts used are as follows: Class 1, population range 500,000 or more; class 2, population range 30,000 to 499,999; class 3, population range 5,000 to 29,999; and class 4, population less than 5,000. Some of the more significant conclusions are as follows:

"School districts of the third class have greater retentive and attractive powers for teachers than school districts of the fourth class. . . . The data show that only 1 in every 21 teachers in districts of the third class change school district employer annually. For teachers in fourth-class districts, the rate is 1 in 9. The former rate . . . may not be far removed from, and may even fall within, a range of desirable movement in terms of school districts . . .

"Teacher movement involving a change in teacher type appears to be the aspect of gravest concern. Between 15 and 16 of every 100 rural teachers become teachers of a different type annually. Much of this high rate is contributed by teachers of the one-room school for whom the annual rate is 1 in 4. Further, just two-fifths of all movement of this kind is intratype, or school-to-school, in nature. . . . Movement by high school teachers among subjects taught also

seems serious in import. . . . Except for the high school type of teacher, the upper grades type in the graded school is the only type likely to succeed to any status other than 'teacher' . . .

"Withdrawal from the profession is at a rate serious in import. While the annual rate of withdrawal, 1 in every 10 rural teachers, accounts for no more than a fourth of all movement, it seems much higher than education as a social enterprise should permit. It is an especially serious problem with the teacher of the one-room school. One of every 5 teachers who withdraw do so to attend college. The initial years of this research covered a period when teachers of every type were vigorously completing requirements for certification. But with due allowance for withdrawal for this very good reason, the withdrawal problem in the large still remains serious. . . .

"Rural teacher movement, in its total aspect, is a most insistent problem. Thirty-nine of every 100 rural teachers change positions annually. While the rate for the high school is the same as for all teachers, in itself alarming in nature, the rate for the one-room-school type is almost incredible. Fifty-two of every 100 teachers of this type change positions annually."

The remedial measures recommended include (1) a dynamic public interest in education, (2) a larger unit for rural school administration, (3) a complete revision of the bases and methods of taxation, and (4) a reduction or elimination of the salary differential now favoring teachers in school districts of the third class.

Pre-employment records and activities of teachers of vocational agriculture: A study of three hundred men prepared at the Pennsylvania State College, C. S. Anderson (*Pennsylvania Sta. Bul. 333 (1936), pp. 52*).—An attempt is made to develop a preemployment pattern or background of conduct, experiences, and records of graduates in agricultural education, and to determine, if possible, how these factors contribute to length of experience in teaching vocational agriculture. Data obtained through a questionnaire and from the office of the registrar were secured for 300 of the 415 who have graduated to date in the curriculum of agricultural education at the Pennsylvania State College. The data are analyzed and discussed under the following headings: College preparatory education; farm experience; expressed attitudes, decisions, and influences toward training for teaching; general intelligence of the groups; participation in extracurricular activities; college expenses; college scholastic achievements and failures; teaching experience and salary increments; and teaching experience and teacher transiency. The following conclusions of value for general predictive purposes are drawn:

"Students presenting themselves as trainees in agricultural education are more likely to become successful teachers of vocational agriculture if their college preparatory education has not been received in the rural elementary school (particularly the one-room school) and the small rural high school. . . . Trainees in agricultural education who are farm reared and who take every opportunity to extend their farm experience, such as spending the summers on a farm during their college years, are most likely to become successful teachers. . . . Those who make early and settled decisions concerning teacher preparation and who receive parental encouragement in their plans to prepare for teaching are most likely to become successful teachers. . . . Students applying for admission to the curriculum in agricultural education should be of average or above average intelligence. . . . While participation in extracurricular activities cannot be used alone to predict the success of a trainee in agricultural education, it is a commendable qualification when associated with other desirable factors. . . . Other things being equal, students who find it necessary to borrow or earn at least a part of their college expenses are the most promising. . . . Generally speaking, high grades may safely be used in predicting success. . . .

The extent to which students fail undergraduate courses is . . . an important measure of the degree of their probable success as teachers of vocational agriculture."

Selectivity of 4–H club work: An analysis of factors influencing membership, D. E. Lindstrom and W. M. Dawson (*Illinois Sta. Bul. 426 (1936), pp. 245–278, figs. 21*).—This bulletin reports the results of the first phase of a study "to determine by exact methods, so far as possible, the selectivity factors in 4–H club work. . . . By selectivity is meant the quality of attraction or of repulsion in club work which draws or fails to draw boys and girls into the work." Scores made on tests and questionnaires administered to 2,263 boys and girls living in 60 communities in 6 counties in Illinois furnished the statistical material for the analysis. Of these 2,263 boys and girls, 1,124 were members of 4–H clubs, 277 were past members, and 862 were nonmembers. The selectivity factors included were socio-economic factors, size of farm, occupations of fathers, nativity of parents, size of family, parental approval of social functions and activities, organizational participation of parents, intelligence, participation in other organizations, rating in ascendance-submission, and appreciation or depreciation of farm life. The following conclusions were arrived at by the authors:

"(1) Young people, especially boys, were drawn into 4–H clubs in relatively greater numbers from homes enjoying the better economic and social advantages. (2) Membership of boys, but not of girls, was affected by the size of farm on which the family lived. Boys from the larger farms joined the clubs in relatively greater numbers than boys from the smaller farms. (3) Boys and girls whose parents approved certain more desirable social activities tended to be drawn into 4–H club work in relatively greater numbers than boys and girls whose parents were less discriminating in their choice of social activities. There was some evidence, also, that the clubs failed to hold young people whose parents approved of undesirable activities as well as they held those whose parents were more discriminating in their approval. (4) Boys and girls whose parents participated actively in various organizations and social activities were attracted in relatively greater numbers to the 4–H clubs than were young people whose parents did not participate in such organizations or activities. (5) Boys, especially, and to a lesser degree girls, who participated to the greatest extent in other organizations were attracted in relatively greater numbers to 4–H clubs. (6) Girls' 4–H clubs tended to attract a relatively greater number of girls who were more ascendant than the average. Apparently boys' clubs did not attract ascendant boys to any greater extent than submissive boys. (7) Boys and girls who were more appreciative of farm life tended to join 4–H clubs in relatively greater numbers than those who disliked farm life. The greater liking for farm life by the members of the clubs was evidently largely the result of experiences previous to or outside of their club work. (8) Boys who had a liking for farm life were attracted to 4–H clubs to a greater extent than were those who lacked this attitude. (9) The 4–H clubs made a greater appeal to, or at least were more easily available to, children of native-born parents than to children of foreign-born parents. (10) Size of family was not, to any practical degree, a selective factor in 4–H club work. (11) There was practically no indication that within the scope of intelligence found among the subjects of this study the grade of intelligence (I. Q.) was a selective factor in 4–H club work."

Serving American agriculture: A report of extension work in agriculture and home economics in 1933 (*U. S. Dept. Agr., Ext. Work Agr. and Home Econ. Rpt., 1933, pp. II+69*).—This is the usual report of extension work in agriculture and home economics in the United States (E. S. R., 70, p. 712). It covers the fiscal year ended June 30, 1933, as regards funds and the year

ended November 30, 1933, as regards results of work done. Pages 37–68 are devoted to statistical tables.

Proceedings of the forty-eighth annual convention of the Association of Land-Grant Colleges and Universities, edited by C. A. McCue (*Assoc. Land-Grant Cols. and Univs. Proc., 48 (1934), pp. 305, figs. 15*).—This is the report of the convention (E. S. R., 72, p. 129) held at Washington, D. C., November 19–24, 1934, and previously discussed (E. S. R., 72, pp. 1, 143, 145). Included are papers and discussions thereon presented in the general sessions of the association, in the general sessions and subsections on resident teaching, experiment station work, and extension work of the section on agriculture, and in the sections on engineering and home economics. The minutes of the executive body, reports of committees, the constitution, officers and committees for the succeeding year, etc., are also included.

Proceedings of the forty-ninth annual convention of the Association of Land-Grant Colleges and Universities, edited by C. A. McCue (*Assoc. Land-Grant Cols. and Univs. Proc., 49 (1935), pp. 348*).—This report of the convention held at Washington, D. C., November 18–20, 1935, and previously discussed (E. S. R., 74, pp. 1, 142, 145) includes the same types of papers, reports, etc., as the report noted above.

FOODS—HUMAN NUTRITION

Nutritive value of the protein of Cajanus indicus, C. D. Miller and R. C. Robbins (*Jour. Agr. Res. [U. S.], 53 (1936), No. 4, pp. 281–293, figs. 5*).—In this contribution from the Hawaii Experiment Station, the authors present a series of experiments on the nutritive value of a meal prepared from the whole seed of pigeonpeas grown in Hawaii. The method of preparation and the analysis of the mixed globulins obtained from the meal are given.

Feeding experiments were conducted to study the growth and reproduction of rats receiving pigeonpea-seed meal as the sole source of protein. A group of 4 young rats was fed a diet consisting of the raw meal 90 percent, Osborne and Mendel salt mixture 3, Crisco 6, and sodium chloride 1 percent, supplemented daily by 10 drops of cod-liver oil and 8 drops of tikitiki (equivalent to 1 g of rice bran). Four litter mates were fed a similar diet containing cooked seed meal. Approximately 18 percent of protein was supplied by the "*Cajanus*" meal in both diets. The growth curves show that the rats receiving the cooked meal gained more weight and were in much better condition at the end of the experiment than were the rats fed the raw meal. Breeding tests demonstrated that reproduction was possible in the animals receiving the diet containing the cooked meal, but the growth response of second generation animals receiving a similar diet supplemented by 5 drops of cod-liver oil and 0.2 g of dry yeast daily was definitely inferior to that of the first generation animals and attempts to produce a third generation were not successful. Pigeonpea-seed protein is, therefore, deemed not adequate for the normal growth and reproduction of rats.

Using the paired feeding method, the *Cajanus* meal was also compared with casein as a sole source of protein. The diets contained approximately 8 percent of protein and were supplemented by daily doses of 10 drops of cod-liver oil and 0.4 g of dry yeast. After a period of adjustment, the rats receiving the *Cajanus* meal grew at a rate that compared favorably with that of the animals receiving the casein.

The results of further paired feeding experiments to determine the effects of adding cystine and tryptophan to the diet containing *Cajanus* meal indicated that tryptophan is the first limiting growth factor of the prepared pigeonpea globulins. When the meal was fed at a level calculated to furnish 8 percent of protein, the addition of cystine did not result in improved growth, but when

the meal furnished 11 percent of protein the addition of cystine resulted in a definite increase in growth.

The problem of baking capacity, N. P. Kosmin (*Das Problem der Backfähigkeit. Leipzig: Moritz Schäfer, [1936], pp. 191, figs. 39*).—Following an introductory review of the process followed in making bread, the author discusses the factors that affect the baking capacity of flour—the flour ferments, the gluten content and structure of the dough, the yield of dough, the chemical changes brought about by fermentation, the changes in the protein content, and the changes undergone by the dough during the rising process. One chapter deals with the methods of improving the baking capacity of low-quality flours. The baking capacities of various flours are compared, and the methods used by different workers in testing the quality of flours are summarized.

The stale-bread problem, C. L. Alsberg (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 12 (1936), No. 6, pp. [2]+221-247*).—This paper presents a summary of bread staling theories and considers the problem from a social as well as an economic standpoint.

The process called staling is the expression of the change in the starch accompanied by a redistribution of water. The practical question now requiring further study is to determine whether the starch of aging bread undergoes colloidal chemical changes characteristic of many other gels or if it undergoes simply a chemical change. If it is the latter, it should be possible to find a catalyst capable of shifting the equilibrium in such a way that it is the same at room temperature as at 55° C. The bread would then not become stale under ordinary conditions of storage. If the change in the starch is primarily a colloidal phenomenon, another method of inhibiting the process of staling in bread must be found. At present the following facts are known:

"Anything that increases the water content seems to be favorable to long life. . . . Anything that hampers the mobility of moisture in the cooled loaf perhaps prolongs life. . . . Anything that conceals the effects of aging of starch prolongs the loaf's life in that the loaf remains acceptable to the consumer." There are at present no scientific data establishing any material difference in the food value or wholesomeness of fresh and of stale bread.

Allergic synovitis due to ingestion of English walnuts, P. Lewin and S. J. Taub (*Jour. Amer. Med. Assoc., 106 (1936), No. 25, p. 2144*).—A report is given of a case of a boy aged 16 yr. with a history of stiffness and swelling of the knees occurring intermittently over a period of 10 yr. It was found that the ingestion of the meats of ½ lb. of English walnuts was followed within 72 hr. by a typical attack. Sensitization tests, cutaneous and intradermal, confirmed the findings. Since the exclusion of nuts from the diet there has not been a recurrence of the synovitis.

The utilization of hydrogenated fat in human metabolism [trans. title], C. Massatsch and H. Steudel (*Deut. Med. Wchnschr., 61 (1935), No. 48, pp. 1918, 1919*).—Hydrogenated fat substituted for lard in the diet of a normal person for a 3-day experimental period was utilized practically to the same extent as lard, as was shown by the percentages of total fat, soaps, and free fatty acids and slightly higher ether-soluble matter in the dried feces. An analysis of the hydrogenated fat with reference to its chemical properties and degree of saturation is given. It was free from bacteria. Its utilization, palatability, and use in cooking are discussed.

Study bacteria in prepared foods, G. J. Hucker (*Farm Res. [New York State Sta.], 3 (1936), No. 1, pp. 1, 8, fig. 1*).—Approximately 30 home-cooked chicken pies were found to contain an organism which has been isolated from various outbreaks of food poisoning, but all of the pies were eaten by humans without evidence of harmful effects. This indicates that the organism may be present in large numbers in food but the conditions may not be favorable to

stimulate the production of the toxin. The scope of further research under way is discussed.

The fortieth report on food products and the twenty-eighth report on drug products, 1935, E. M. BAILEY (*Connecticut* [*New Haven*] *Sta. Bul. 388* (*1936*), *pp. 653–693*+[*1*]).—In addition to the routine analyses of foods and drugs, this annual report (E. S. R., 74, p. 274) contains the first report of inspection and biological testing of vitamin D milk and data as to the vitamin C content of orange juice and orange products.

Foods and drugs, E. R. TOBEY (*Maine Sta. Off. Insp. 159* (*1936*), *pp. 18*).—In this annual report (E. S. R., 74, p. 721) are given the results of the analysis of food and drug samples submitted for inspection.

Diets to fit the family income, R. S. CARPENTER and H. K. STIEBELING (*U. S. Dept. Agr., Farmers' Bul. 1757* (*1936*), *pp. II*+*38*, *figs. 10*).—This presents in popular form the material contained in Circular 296 (E. S. R., 70, p. 416), with the addition of sample menus and market orders.

Is gastric secretion or digestion impaired by a mixture of carbohydrate and protein in the diet? H. SHAY, J. GERSHON-COHEN, and S. S. FELS (*Amer. Jour. Digest. Diseases and Nutr.*, *3* (*1936*), *No. 4*, *pp. 235–238*, *figs. 5*).—Four persons with normal gastric acid response and one with achlorhydria were studied by fractional gastric analysis following the administration of test meals consisting of water, pure carbohydrate, pure protein, and a mixture of carbohydrate and protein. The results of 6,000 determinations show that a mixture of carbohydrate and protein in the test meal did not interfere with the gastric secretions. The carbohydrate digestion in the stomach appeared to be favored by the mixture with protein, probably due to the acid-combining power of the protein bringing about a more favorable medium for continued ptyalin activity on the carbohydrate in the stomach.

The biological value of proteins, VI, VII (*Biochem. Jour.*, *29* (*1935*), *No. 7*, *pp. 1702–1711*, *figs. 3*; *pp. 1712–1719*).—A continuation of the series noted previously (E. S. R., 69, p. 895).

VI. *Further investigation of the balance sheet method,* H. Chick, J. C. D. Hutchinson, and H. M. Jackson.—This study investigated the variability in endogenous nitrogen excretions by the same animal at different times. Two precautions to improve the experimental procedure were noted. To maintain the appetite during the experimental periods when nitrogen-free or low nitrogen diets were fed, the complete diet in the period immediately before the experiment and the experimental diet during the preparatory period were fed at levels of about from 11 to 14 g of dry food daily. This amount was just enough to maintain weight. The change of cage was found to affect the appetite and, therefore, the rat was placed in the metabolism cage during the preliminary 2- to 3-day period on the experimental diet.

When adult rats were transferred from diets containing 18 percent protein to a nitrogen-free diet and maintained on the latter diet for periods of from 10 to 14 days, the urinary nitrogen fell rapidly during the first 2 or 3 days, and then decreased very gradually. Similar changes were noted when the change was made from a high to a low protein diet. The fecal endogenous nitrogen excretion was more constant during the 10- to 14-day period and was roughly proportional to the food intake when this was not less than from 100 to 120 calories per kilogram. The balance sheet method developed by the authors was "considered to afford reasonably satisfactory estimates of these values for use in the calculation of the biological value of the protein investigated."

VII. *The influence of variation in the level of protein in the diet and of heating the protein on its biological value,* H. Chick, M. A. Boas-Fixsen, J. C. D. Hutchinson, and H. M. Jackson.—Using the method referred to above, the authors determined the biological value for the maintenance of nitrogenous

equilibrium in the adult rat for the proteins of whole wheat, white flour, wheat germ, corn endosperm, whole milk, lactalbumin, heated lactalbumin (at approximately 120° C. for 72 hr.), casein, heated casein (at from 112° to 125° for 72 hr.), and heated casein purified by reprecipitation and extraction with dilute alcohol. These foodstuffs were fed at levels in the diet varying from 3 to 10 percent.

The average mean biological value, when the level of protein in the dry diet was from 3 to 6 percent, was for whole wheat 100, for white flour 84, for wheat germ 90, for corn endosperm 88, for whole dried milk 89, and for lactalbumin 92. When the level of protein was increased to a level of from 7 to 10 percent, the biological value was lowered for all proteins except the whole milk. Heating casein at from 112° to 125° for 72 hr. or purifying it did not lower its biological value, but heating it at 150° for 66 hr. decreased the value from 64 to 44 when fed at a 5-percent level and reduced the digestibility from 93 to 73 percent. Heating lactalbumin at 120° for 72 hr. slightly reduced its biological value and lowered its digestibility from 95 to 69 percent.

The accuracy of the balance sheet method is discussed.

A preliminary report on the nitrogen metabolism of preschool children, L. C. KUNG and W. Y. FANG (*Chin. Jour. Physiol., 9 (1935), No. 4, pp. 375–381*).—This paper included a protein metabolism study on two Chinese boys, 56 and 53 mo. old, respectively, fed an uncontrolled diet made up mainly of white flour and rice, a variety of vegetables, a small amount of fruit, some meat and eggs, and 3 or 4 cups of soybean milk a day. The experiment was of 16 days' duration divided into 4 periods of 4 days each. The urine was collected and analyzed on a 24-hr. basis and the feces for each period. The food consumed by the children was weighed and the samples were analyzed. The results showed a daily nitrogen intake varying between 0.39 and 0.56 g per kilogram of body weight for the two boys. The daily nitrogen excretion varied from 0.4 to 0.53 g per kilogram, and the nitrogen retention averaged 0.03 and 0.054 g per kilogram for the two subjects, respectively.

The second study included in this paper was on the protein utilization of two Chinese girls, 3 and 4 yr. old, respectively, fed on a controlled mixed diet for 33 days divided into 3 periods. The diet consisted of weighed amounts of rice, steamed bread, egg, lean pork, 2 vegetables, and banana and supplemented with soybean milk for the first and third periods and cow's milk as dried milk powder made up with water for the second period. Samples of the food were analyzed. The nitrogen intake on the diets varied from 0.47 to 0.53 g per kilogram of body weight and the nitrogen retention from 0.046 to 0.14 g per kilogram. These observations showed no marked differences for these children in the protein utilization of mixed diets when supplemented with soybean milk or with cow's milk.

Tables are given summarizing the daily nitrogen balances of the children on the two series of experiments.

The composition of a food poor in heavy metals and its influence on rats, J. A. F. KOK (*Arch. Néerland. Physiol. Homme et Anim., 21 (1936), No. 2, pp. 247–265, figs. 6*).—Using special methods which are described in detail for each of the ingredients, the author has succeeded in preparing a synthetic food mixture for rats containing in the day dosage of 15 g only about 60γ of heavy metals, including 21γ of iron and 24γ of copper.

Rats on this diet showed low hemoglobin values as early as 14 days after being put on experiment. After the minimum was reached there was a slow increase in hemoglobin, which became rapid on the addition of extra salts or pure iron. As the diet contained about the same quantity of copper as has been found in human milk, an amount sufficient to prevent anemia, it was

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considered that the copper content of the diet was adequate and iron was the limiting factor.

It is concluded that 21γ of iron per rat per day, or 1.4 mg per kilogram of food, is the minimum quantity for keeping the animal alive and growing, although at an abnormal rate.

Calcium absorption and calcium retention on different diets [trans. title], E. Hesse and C. Barndt (*Klin. Wchnschr., 14 (1935), No. 45, pp. 1607–1609*).—In this investigation dogs were fed potentially acid and alkaline diets supplemented with five calcium preparations of different solubilities. The results indicated that the calcium absorption depended mainly upon the pH of the gastrointestinal contents and not so much upon the water solubility of the calcium preparation. An acid diet increased and an alkaline diet decreased calcium absorption. Experiments with growing rats indicated that acid diets with added calcium citrate-glycerophosphate increased both absorption and retention of the calcium, but a similarly supplemented alkaline diet showed a decreased retention. With grown rats no increase in retention of calcium was noted either on the alkaline or the acid diets with the supplement.

Normal magnesium metabolism and its significant disturbances, B. S. and E. W. Walker (*Jour. Lab. and Clin. Med., 21 (1936), No. 7, pp. 713–720*).—This paper presents a brief review of recent literature dealing with the pathologic chemistry of magnesium. Particular emphasis is given to the retention of magnesium which occurs in some cases of renal disease.

In 87 determinations on blood serum taken from medical students, the values varied between 1.6 and 3 mg per 100 cc of serum, with a mean of 2.2 mg. The range in a group of medical and surgical hospital cases showing no apparent disturbances of mineral metabolism was between 1.5 and 2.9 mg, with a mean of 2.3 mg.

The 24-hr. urinary output of magnesium in the group of medical students varied from 32.5 to 307 mg, with a mean of 103 mg. In a group of hospital cases the range was from 5 to 243 mg, with a mean of 86 mg.

Five cases of hypertension associated with renal damage showed abnormally high serum magnesium values. Cases of hypertension without severe renal damage showed a range of 1.86–2.7 mg, with a mean of 2.36 mg. It appears that serum magnesium may be elevated in moderate or severe renal insufficiency.

Variations in the magnesium content of the normal white rat with growth and development, D. M. Greenberg and E. V. Tufts (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 135–138*).—In continuation of studies (E. S. R., 74, p. 127) using the Greenberg, Anderson, and Tufts method for determining magnesium (E. S. R., 75, p. 301), the authors found the magnesium content of the fetuses of rats to be 17.9 and 19 mg per 100 g and of the 4-week-old young 40 mg, persisting at this level through the age of 11 weeks and then decreasing to about 20 mg. The males and females showed no significant difference in the magnesium level. The water content of normal rats decreased during the life of the rat.

Human iodine balance, V. V. Cole and G. M. Curtis (*Jour. Nutr., 10 (1935), No. 5, pp. 493–506, figs. 9*).—In this investigation the iodine balance was determined on three subjects in 3-day periods for 15 days, on the fourth subject for 9 days, and on the fifth for 6 days. Iodine determinations were made on food, urine, feces, and in three cases on the sweat, according to the methods described by Phillips and Curtis and by McCullagh and noted on page 150.

For normal subject A the intake was 156 μg (micrograms) of iodine per day, and the combined output in urine and feces averaged 74 μg, giving a positive balance of 82 μg. For normal subject B the intake was 56 μg, combined output 44 μg, and positive balance 12 μg; for subject C with myxedema the intake was 39 μg, combined output in urine, feces, and sweat from 52 to

50 μg, a negative balance of 13 and 11 μg including skin excretion, and a positive balance of 6 and 9 μg not including skin excretion, which contained 19 and 20 μg of iodine daily; for subject D with exophthalmic goiter the intake was 162 and 147 μg, combined output in urine, feces, and sweat 155 and 170 μg, giving a positive balance of 7 μg and a negative balance of 24 μg; and subject E with exophthalmic goiter an intake of 158 μg, combined output 235 and 427 μg, and a negative balance of 77 and 91 μg. The last two subjects showed an increased fecal loss of iodine due to hyperthyroidism. The combined output of urine and feces accounted in some cases for less than 50 percent of the iodine intake. Fairly uniform output of iodine was noted for an individual on a monotonous diet.

The blood changes in normal pregnancy and their relation to the iron and protein supplied by the diet, F. H. Bethell (*Jour. Amer. Med. Assoc., 107 (1936), No. 8, pp. 564–569, figs. 9*).—Studies were made of the blood of 66 healthy young women during the last trimester of pregnancy and of 50 healthy nonpregnant women of the same age group used as controls. All subjects were under constant supervision in an institution.

Ninety percent of the pregnant women showed lower red blood cell counts and percentages of hemoglobin than the nonpregnant subjects, and 76 percent of the pregnant subjects exhibited blood values lower than could be attributed solely to hydremia. The cases of pregnancy in which definite anemia exists are placed in two distinct groups. One group, due to a deficiency of iron, is characterized by a lowered color index, smaller red blood cells, and an increased percentage of reticulocytes. In the other group there is an approximately equivalent reduction of red blood cells and hemoglobin, resulting in a color index nearer unity in high, normal, or increased volume of the erythrocytes and a reticulocyte percentage below the average normal range.

A continuous determination of the iron exchange was carried out on a healthy young woman throughout the last 63 days of pregnancy and the first 12 days after delivery. She received a diet supplying 7.1 mg of iron daily, supplementary additions of vitamins A, B, C, and D, and a total protein intake of approximately 80 g. The results show that in spite of a relatively low iron and copper content of the diet and practically no retention of either element during the last months of gestation, the blood values were maintained at levels distinctly above the average in pregnancy. The blood of the infant also showed high normal values.

In this series of cases the percentage of pregnant women developing iron deficiency anemia was about equal to that of the nonpregnant subjects showing a tendency to that type of anemia. The administration of inorganic iron preparations in adequate dosages during gestation was effective in those cases in which predisposition to hypochromic anemia already existed. Those patients with an anemia of a hypoplastic nature showed no response to iron administration, but frequent improvement was noted after they were placed on diets containing approximately 100 g of protein of high biological value.

The iron and copper content of milk throughout the season, as related to anemia development in rats, W. E. Krauss and R. G. Washburn (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 247–252*).—This paper from the Ohio Experiment Station reported the results of iron and copper determinations of the pooled milk of seven Jersey and three Holstein cows at approximately biweekly intervals for 1 yr., divided into seasonal periods to show the usual variations in feeding. The slight variations found in iron, from 0.305 to 0.442 mg per liter, and in copper, from 0.112 to 0.222 mg per liter, could not be correlated with the seasonal change in the feeding program. The milk obtained on each of the first dates of each period was fed exclusively to pairs of rats, one receiving raw milk and one milk of the same sample pasteurized. Nutritional anemia de-

veloped at approximately the same rate on milk produced throughout the year. The evidence obtained indicated that the iron and copper content of milk was not affected by feeding and environmental conditions.

The correlation between vitamins A and D [trans. title], F. THOENES (*Deut. Med. Wchnschr., 61 (1935), No. 52, pp. 2079–2081*).—This paper is an extensive review of investigations indicating a reciprocal action of vitamins A and D. The author points out that the effects of D hypervitaminosis were relative to the other constituents of the diet and could be counteracted by large doses of vitamin A, and that the prevention and healing of rickets was facilitated by the combined effect of vitamins A and D as they occur in liver oils or in combination in concentrated forms.

The microscopic demonstration of vitamin A in animal tissues.—III, Information on the paraplasmic liver cell inclusions [trans. title], F. R. VON QUERNER (*Klin. Wchnschr., 14 (1935), No. 34, pp. 1213–1217*).—Using a fluorescent microscope, the author demonstrated a fluorescent substance in the lipoid globules of the parenchyma of liver and designated it as Leuchtstoff X (LX). It is present also in the fat inclusions of suprarenals, hypophysis, and in the fat rolls of retinal rods and cones. To demonstrate this substance a 20-cc solution of sodium carbonate was added to 1 cc of liver oil and thoroughly mixed until a fine emulsion existed. Inspection of this mixture with a fluorescent microscope showed the droplets of liver oil to have a fluorescent property which certain other oils did not have.

The properties of this substance, such as solubility, stability to heat, acid, alkalies, and ultraviolet rays, and the position of the spectrum bands, were partially identical with vitamin A. Emulsified fat of animal origin rich in vitamin A and vitamin A concentrates showed the fluorescence. The liver, suprarenals, and eyes of rats on a vitamin A-free diet showed a considerable decrease of Leuchtstoff X. The livers of rats on a vitamin A-rich diet showed a fatty degeneration in the cells and a decrease in the number of fluorescent fat droplets. On such diets there was also a complete absence of fluorescent substances in the cells of the pupil of the eye. It is suggested that vitamin A was synthesized in liver cells and also in the epithelial cells of other organs and that it was deposited in a form which has fluorescent properties. It is concluded that Leuchtstoff X in the paraplasmic fat globules of the liver parenchyma either was vitamin A or was closely related to this vitamin. This demonstration is the first to localize the vitamin in the cell.

The content and variations of vitamin A in the liver [trans. title], A. CHEVALLIER and Y. CHORON (*Compt. Rend. Soc. Biol. [Paris], 120 (1935), No. 40, pp. 1223–1225*).—Using the method described previously (E. S. R., 73, p. 722), the authors have found the liver of rats to have a lower and the blood a higher content of vitamin A than normal following the use of ether as an anesthetic. This observation is considered of interest from the point of view of the passage of fat-soluble substances through membranes. In a repetition of the earlier studies on the vitamin A content of the livers of guinea pigs, the results indicating a very low content were confirmed for some of the animals, while others showed a content practically as high as habitually found in rats and sheep. The content of vitamin A in the blood was practically constant. The question is raised as to how this content is maintained in the presence of such variations in the liver.

The carotene-vitamin A metabolism of the human fetus.—Carotene and vitamin A determinations in the blood of pregnant women, in the placenta, in the blood of the fetal cord, and in the fetal liver [trans. title], H. WENDT (*Klin. Wchnschr., 15 (1936), No. 7, pp. 222–225*).—In this study of the carotene and vitamin A content the author, with the cooperation of F. Lütgerath and D. König, made determinations on the blood of 40 healthy women in various stages

of pregnancy and on the placenta, cord blood, and liver of fetuses of 3–10 mo. pregnancies by the use of the antimony trichloride method of Brockmann and Tecklenburg and Menken. The results showed that the vitamin A and carotene content in the blood serum of pregnant women differed from that of nonpregnant, and that in 15 percent it decreased toward the end of pregnancy, with vitamin A values falling to zero. Occasional traces of vitamin A and small quantities of carotene were found in the placenta and in the blood of the cord. These quantities, which were considerably below that in the mother's blood, indicated that the placenta blocked the passage of the two substances. Considerable quantities of vitamin A were present in the fetal liver, but below the average contained in the liver of the growing child. Carotene present in the liver of a growing child was entirely absent in the fetal liver.

In the second half of pregnancy, particularly during the last few weeks, the vitamin A content of the fetal liver decreased from an average of 62 blue units for 3–5 mo. pregnancies to 35 units for 6–10 mo. pregnancies. The depleted A reserve is quickly restored by mother's milk, particularly colostrum, which is rich in the vitamin. The low carotene and vitamin A values are discussed with reference to the high vitamin C and perhaps D content of the placenta and cord blood. The literature on carotene-vitamin A metabolism is discussed with reference to the results obtained by this study. Tables are given on the carotene and vitamin A contents.

Does the nature of the carbohydrates of the ration have an effect on the evolution of avitaminosis A? [trans. title], L. Randoin and S. Queuille (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 12, pp. 1172–1177, figs. 3*).—Following the same general methods as in an earlier study of the possible effect of the type of protein on the production of avitaminosis A (E. S. R., 72, p. 883), the authors have compared various carbohydrates with respect to the development of signs of vitamin A deficiency in rats on diets otherwise identical.

With the exception of galactose and lactose, sugars extremely toxic for the young rat at a level of 63.5 percent of the diet, the nature of the carbohydrates studied, including glucose, levulose, sucrose, maltose, and dextrin, had practically no effect on the development of symptoms of A deficiency. The general direction of the weight curves, the moment at which growth ceased, the dates of appearance of xerophthalmia, and the survival periods were all practically superimposable.

Chemical examination of Chinese remedies for nightblindness, P. G. Mar and B. E. Read (*Chin. Jour. Physiol., 10 (1936), No. 2, pp. 273–283*).—In a preliminary survey, 148 remedies for night blindness listed in the fourth chuan of the Pen-t'sao, the Chinese herbal, compiled by Li-shih-chen in 1597, were tested for their vitamin A and provitamin A content, qualitatively by the antimony trichloride color test and quantitatively by the Carr-Price technic (E. S. R., 56, p. 10) as modified by B. P. Codex, by the Moore method (E. S. R., 62, p. 208), and with the vitameter. The list of medicinals reported in this paper consisted of 65 belonging to the plant kingdom and 20 to the animal. The results showed that these substances contained vitamin A or provitamin A up to from 10 to 20 times the average value for commercial cod-liver oils. Of the animal substances, liver showed the highest values and aqueous humor of crows' and mackerels' eyes yielded the lowest values. Vitameter determinations showed one-third of the vegetable substances to be from 5 to 15 times as potent in vitamin A as cod-liver oil.

Accuracy of the rat growth method in determination of vitamins B_1 and B_2, H. K. Lassen (*Acta Path. et Microbiol. Scand., 13 (1936), No. 3, pp. 277–308, figs. 9*).—This paper summarizes the more important points brought out in an extensive investigation, published originally as a dissertation in Danish, of

the accuracy of the rat growth method as compared with other methods in use for determining vitamins B_1 and B_2.

In the experimental work reported the source of vitamin B_2 was a concentrated extract of distiller's yeast autoclaved for 5 hr. at 120° C. according to the Chick and Roscoe technic, and of vitamin B_1 the Kinnersley and Peters' extract. The former was fed in a dosage of 1 cc and the latter of 1 drop daily. Standard curves of reference were obtained with graded doses of the international vitamin B_1 standard and with the author's extract of vitamin B_2.

From statistical analysis of the data obtained in the present investigation the data reported by Coward in curative pigeon tests, Coward et al. and Birch et al. in rat growth tests, and Birch and Harris in the bradycardia test the author draws the following conclusions:

"Among the various rat methods for determination of vitamin B_1, the weight-increase method covering a period of 5 weeks is found on the whole to be the most serviceable and also to involve the smallest mean error. Both the bradycardia method and the cramp method fall short in this respect, that the reaction does not appear with daily doses of 1 international unit or less."

Further studies on the effect of storage on the vitamin C potency of foodstuffs, S. Ranganathan (*Indian Jour. Med. Res., 23 (1936), No. 3, pp. 755–762*).—Earlier findings indicating that a leafy vegetable like spinach loses its vitamin C rapidly on storage, while a fruit like the orange loses little or none of it during storage for as long as 2 weeks (E. S. R., 74, p. 886), led to a further comparison of these two types of food materials. The same plan was followed as in the previous study, and the effect was also determined of storage at a somewhat higher temperature, 19° to 22° C.

The results confirmed the earlier conclusions. The green leafy vegetables tested, coriander (*Coriandrum sativum*), tender amaranth (*Amaranthus gangeticus*), and fenugreek (*Trigonella faenumgraecum*) were found to lose vitamin C very rapidly on storage. As long as the fruits tested, including chilies (*Capsicum annuum*), mango, and bitter gourd (*Momordica charantia*), remained green there was very little loss of vitamin C on storage. In the case of mango the outer skin proved very rich in vitamin C and continued so as long as it remained green. Both the skin and the inner pulp showed a sudden fall in vitamin C on ripening and a further loss after storage. Storage at higher temperatures hastened ripening as also the destruction of vitamin C after ripening.

Some of the initial values reported are coriander leaves as purchased on the local bazaar 69 mg ascorbic acid per 100 g, tender amaranth leaves 112.1, fenugreek leaves 140.7, green chilies 57.4, and green bitter gourd 106.7 mg per 100 g. The values for green mangoes were entire fruit 27.5, outer skin 82.1, and pulp 20.9 mg per 100 g, and for the fully ripe fruit, entire fruit 11.3, outer skin 26.9, and pulp 7.1 mg per 100 g.

A comparative study of the vitamin C content of several varieties of Chinese oranges, H. C. Hou (*Chin. Jour. Physiol., 9 (1935), No. 3, pp. 223–243, figs. 12*).—In this investigation the Höjer tooth method as modified by Key and Elphick (E. S. R., 67, p. 189) and the Sherman 90-day prophylactic test were used to determine the vitamin C content of three varieties of Chinese oranges, the Swatow Michü, the Canton, and the Wenchow, fed at levels of 1, 2, 3, and 4 cc daily, and the American Sunkist orange fed at levels of 0.5, 1, 2, 3, and 4 cc daily. Consistent results were obtained with the two methods.

The Canton orange was slightly superior to the Sunkist in ascorbic acid content, the Swatow Michü had about the same value as the Sunkist, and the Wenchow orange was decidedly inferior to the other oranges, as 4 cc did not protect the guinea pig against scurvy. The amount of juice extracted from

the four varieties of oranges varied from 41.4 cc to 53.7 cc per 100 g of orange, and the percentage of peel varied from 22.3 to 38.2.

Drawings and microphotographs showing changes in the tooth due to vitamin C deficiency and tables summarizing the data are included.

An addendum reported the determination of vitamin C values by the Birch, Harris, and Ray technic (E. S. R., 70, p. 741) for the four varieties and for stored Swatow and Sunkist oranges. The results obtained showed the same order of vitamin C content as that obtained by the biological tests.

The vitamin C content of two varieties of Chinese amaranth, hsien ts'ai, H. C. Hou (*Chin. Jour. Physiol., 9 (1935), No. 3, pp. 253–260, fig. 1*).—Using the Key and Elphick technic for the biological test and the Birch, Harris, and Ray technic for the chemical test, the author found that 2 g of red amaranth had about the same vitamin C potency as 1 cc of Sunkist orange juice and 1 g of green amaranth had a somewhat higher potency than 1 cc of orange juice. By the chemical method, the ascorbic acid content of red amaranth averaged 0.25 mg and that of green amaranth averaged 1.09 mg. Chinese green amaranth was, therefore, quite rich in vitamin C.

Some differences in the values obtained by the chemical and biological assays of vitamin C in certain foods, H. C. Hou (*Chin. Jour. Physiol., 9 (1935), No. 3, pp. 291–297, fig. 1*).—Using the Key and Elphick method and the Bessey and King (E. S. R., 71, p. 137) modification of Tillmans' method, the author made a comparative study of the results obtained by the two methods for the ascorbic acid content of alfalfa, beet leaves, beet roots, and fresh capsicum, and included the results previously obtained for red and green amaranth and the four varieties of oranges. The ascorbic acid values obtained by the chemical and biological methods for oranges were found to be in good agreement, but the values for vegetables were lower when determined with the biological than with the chemical method. The differences in the results were discussed with reference to the presence of interfering substances in the titration method and incomplete absorption in the biological method.

***The vitamin C content of Hunan lachiao,* Capsicum annuum, L. var. longum,** H. C. Hou (*Chin. Jour. Physiol., 10 (1936), No. 1, pp. 179–186, figs. 3*).—Vitamin C assays are reported for fresh and dried redpepper. Moderately good protection from scurvy, as measured by the Key and Elphick tooth method, was given by 0.5 and 1 g daily of the fresh material. No protection was given by from 0.6 to 12 g daily of the dried material, as measured by both the Key and Elphick and the Sherman methods. It is concluded that the vitamin C in the redpepper is destroyed by drying in the sun and open air.

Further studies on the chemical and biological assay of vitamin C, H. C. Hou (*Chin. Jour. Physiol., 10 (1936), No. 1, pp. 191–197, figs. 4*).—The methods used in the study noted above were applied to Chinese pomelo, green amaranth, and alfalfa supplemented with 0.5 mg of pure ascorbic acid. The results with pomelo juice indicated the minimal protective dose for guinea pigs to be about 2.2 cc as against the calculated dose of 2 cc according to the average titration figures when this was compared with pure ascorbic acid as a standard for feeding. For green amaranth cultivated in the absence of short ultraviolet rays, the minimal protective dose was over 2.8 g per day, which was higher than the calculated titration value of 2 cc. The minimal protective dose of ascorbic acid was estimated at 2.4 mg per day. Small doses of alfalfa supplemented with small doses of pure ascorbic acid showed a greater antiscorbutic activity than was produced when the ascorbic acid was replaced by an equivalent or larger dose of alfalfa. In explanation it was stated that "there is apparently interference in absorption when a greater bulk of vegetable is consumed at one time."

The relation between the antiscorbutic activity and the mode of administration of ascorbic acid, H. C. Hou (*Chin. Jour. Physiol., 10 (1936), No. 2, pp. 213–220, fig. 1*).—In extension of a previous investigation (E. S. R., 74, p. 136), comparisons were made of the biological effect, as determined by the Key and Elphick method, of ascorbic acid when administered in different ways and of same total dose administered at different intervals.

The results showed that 0.4 and 1.1 mg ascorbic acid injected subcutaneously gave the same degree of protection as 0.85 and 2 mg, respectively, given orally. Guinea pigs receiving 0.5, 1, or 2 mg ascorbic acid by rectum showed the same tooth condition as the negative controls. A subminimal protective dose of 2 mg ascorbic acid was given in dosage of 1 mg twice daily and in dosage of 4 mg once in 2 days. Both methods afforded approximately the same degree of protection. The ascorbic acid content of the intestine, liver, and adrenals showed practically no difference among the various groups except that the adrenals and possibly the testes showed a slight increase when the animal received large doses of vitamin C.

The variation of vitamin C content in certain fruits and vegetables, H. C. Hou (*Chin. Jour. Physiol., 10 (1936), No. 2, pp. 221–236*).—The ascorbic acid content was determined chemically by the method of Bessey and King and biologically by the Key and Elphick method in 9 citrus fruits and 3 vegetables which were bought from the open market at different times of the year.

Lemons were found to have a "market" variation of from 0.374 to 0.69 mg ascorbic acid, Swatow oranges from 0.174 to 0.55 mg, Canton oranges from 0.474 to 0.902 mg, Wenchow oranges from 0.032 to 0.221 mg, Sunkist oranges from 0.34 to 0.647 mg, Hsin-hui-ch'en-tzu (oranges) from 0.348 to 0.579 mg, Kuangtung Pao-p'i-chü (oranges) from 0.391 to 0.458 mg, and Fu-chü from 0.339 to 0.391 mg. Of the three varieties of pomelo examined, the Kuanghsi Satien showed a vitamin C variation of from 1.089 to 1.369 mg, pink Amoy pomelo from 0.368 to 0.58 mg, and white Amoy pomelo from 0.375 to 0.54 mg. Twenty samples of alfalfa showed a range of ascorbic acid content of from 0.746 to 1.693 mg per gram of vegetable.

Twelve samples of green amaranth gave ascorbic acid values ranging from 0.369 to 1.167 mg. The amaranth had a relatively constant vitamin C content during growth and a marked decrease at the beginning of flowering and seed formation. Green amaranth grown under glass to exclude short ultraviolet rays had an ascorbic acid content of 1.156 mg, which was higher than that of market amaranth which averaged 0.829 mg. Redpepper, *Capsicum annuum longum*, showed a steady increase of vitamin C content during ripening, from 0.118 mg when it was light green in color to 2.444 mg when it was greenish brown, and a decrease to 1.848 mg when it turned bright red. Citrus fruits showed a vitamin C concentration of from 1.136 to 1.761 mg in the outer skin, from 0.36 to 1.425 mg in the white inner skin, and from 0.089 to 0.538 mg in the juice.

Mechanism of vitamin C synthesis in the lens [trans. title], H. K. Müller (*Klin. Wchnschr., 14 (1935), No. 42, pp. 1498, 1499*).—Evidence was presented that the eyelens synthesized ascorbic acid from sugar with the help of glutathione. Beef lenses from young animals in Ringer-Locke solution at 37° C. for 5 hr. showed an increase of approximately +2 mg percent in vitamin C, an increase of +11 mg percent in reduced glutathione, and a decrease of 14 mg percent in sugar. Lenses from old animals treated in the same manner showed no increase in vitamin C, a tendency to increase the reduced glutathione content, and a decrease of 8 mg percent in sugar.

It was suggested that this synthesis was bound up with the hexosephosphate stage of carbohydrate metabolism. The hypothesis was based on the facts that

the hydrogen needed to reduce glutathione was more readily available from a hexosephosphate than from a hexose, that in cases of cataract the vitamin C and sugar content was decreased, and that cataracts frequently occur in cases of diabetes mellitus in which the process of hexosephosphate formation is disturbed. A series of experiments also tended to prove the hypothesis.

Determinations of the acid-soluble organic phosphate showed the content of the lens from young animals to be approximately 33 mg percent, from the old 27 mg percent, and with cataract 2 mg percent. Rabbits in which the process of forming hexosephosphate was inhibited by daily injections of phlorhizin had an average vitamin C content in the lens of 14 mg percent, while the lens of control rabbits averaged 24 mg percent. No change was noted in the phosphate content of the lens and of the suprarenals, which also showed no change in vitamin C content. Beef lenses in Ringer-Locke solution and phosphate buffer in an atmosphere of nitrogen contained approximately 7 mg percent more vitamin C than lenses treated in the same manner with added monoiodoacetic acid. However, the same procedure, using ascorbic acid in place of lens, indicated that monoiodoacetic acid promoted oxidation of ascorbic acid. The author states that these results are suggestive and not absolute evidence.

Vitamins in human nutrition: Vitamin-C reserves of subjects of the voluntary hospital class, L. J. Harris, M. A. Abbasy, and J. Yudkin (*Lancet [London], 1936, I, No. 26, pp. 1488–1490*).—This paper summarizes the main conclusions reached in an extension of earlier surveys of urinary excretion of vitamin C, following the technic previously described (E. S. R., 74, p. 888).

A series of control tests was first carried out under rigorously standardized conditions. A group of 6 adult volunteers was placed on a diet low in vitamin C, followed by a strict scurvy-producing diet until their reserves had fallen to a subnormal level, as indicated by a low urinary output. The reputed minimum-optimal daily dose of ascorbic acid (25 mg) was then added to the vitamin C-free diet, after which the daily excretion of vitamin C gradually rose, becoming steady after from 42 to 49 days at from 13 to 14.5 mg (average 13.8 mg) daily, with little variation between individual subjects. When this stage had been reached, the administration of a test dose of 700 mg of ascorbic acid was followed by a good response on the first or second day. In a further group of 11 adult subjects, a daily supplement of 40 mg of ascorbic acid, as orange juice, to a diet not rich in fruits or vegetables and estimated to contain 15 mg per day led to a daily excretion at equilibrium after 35 days of from 25 to 29 mg per day. In a previous experiment the addition of 90 mg to a similar diet led to the excretion of from 49 to 56 mg per day.

It is concluded from these observations on normal subjects that if a subject excretes less than 13 mg of ascorbic acid per day and fails to respond on the first or second day to a test dose of 700 mg per 10 stone (140 lb.) body weight, his diet has contained less than the reputed optimum of vitamin C. The results are also thought to indicate that the daily output of vitamin C is governed by the past dietary intake.

In a group of 74 adult patients from medical and surgical hospital wards, the average ascorbic acid excretion for the whole series was found to be as low as 8.9 mg per day, with values under 13 mg for 62 of the patients examined. Results obtained with 30 children showed a similar high proportion of cases with a subnormal excretion of vitamin C. This general tendency toward low values is thought to suggest that the intake of vitamin C of this class of the population is generally below the reputed optimum or that of normal subjects examined in various countries. Included among the hospital subjects were 12 cases of gastric or duodenal ulcer and 7 cases of so-called dyspepsia which had been on a "restricted diet." The urinary values for all of these cases were among the lowest 44 and for 16 among the lowest 29 values reported. These

findings are considered of significance in view of the low vitamin C content of diets frequently prescribed for ulcer. The addition of the strained juice of one orange to the daily ration is advocated as a routine measure applicable for most gastric cases.

A note by S. Kelly reports a similar survey of the urinary excretion of vitamin C in 34 unselected adult hospital patients. Of these, 14 excreted less than the minimum standard of 13 mg per day. Eight of the patients 70 yr. of age or over showed a relative deficiency. Eight on dietetic treatment for gastric or duodenal ulcers excreted over 13 mg of vitamin C per day at the time of admission to the hospital, but after 1 week on the dietary treatment the level decreased to an average of 9 mg.

Vitamin C deficiency during pregnancy [trans. title], G. Török and L. Neufeld (*Klin. Wchnschr., 15 (1936), No. 12, pp. 417–419*).—Using the rise of blood catalase after injecting vitamin C for detecting vitamin C deficiency, a method previously described (E. S. R., 73, p. 428), the authors found that of 75 pregnant women 16 showed vitamin C deficiency. An intake of 350 mg ascorbic acid over a period of 10 days completely restored vitamin C. Vitamin C medication is advocated for pregnant women during the winter months to insure adequate amounts needed during pregnancy and birth and for immunity against diseases. A review of the literature on vitamin C requirements for humans is given.

Ascorbic acid studies in infants [trans. title], F. Widenbauer (*Klin. Wchnschr., 15 (1936), No. 23, pp. 815–817*).—Using the test dose method described by Harris and Ray (E. S. R., 73, p. 427) for determining vitamin C subnutrition, the author found that 22 artificially fed infants from 1½ to 12 mo. of age and suffering from different diseases, 2 from scurvy, showed a C hypovitaminosis of various degrees. The formula usually used in infant feeding, 800 g ⅔ milk and 10 cc lemon juice, contained approximately 11 mg of ascorbic acid as compared to 50 mg found in 100 g of breast milk. Therefore, from 20 to 40 mg of ascorbic acid was added to the formula. Certain observations during C hypervitaminosis indicated an increased sensitivity of the vagus.

The influence of ascorbic acid on blood coagulation.—Investigations on the working mechanism, in vivo, of ascorbic acid in normal and pathological conditions [trans. title], L. Cotti and P. Larizza (*Klin. Wchnschr., 15 (1936), No. 7, pp. 227–231*).—In this study the authors found that from 50 to 100 mg of ascorbic acid injected intravenously daily for from 5 to 8 days exerted an influence resulting in a decrease in the time required for coagulation of the blood of a number of normal persons, of hemophiliacs, and of persons with different hemorrhagic diatheses. On the other hand, coagulation time was increased by ascorbic acid injections for certain other normal persons. To further study the change in coagulation time determinations of the amount of various blood components were made shortly before and at different times after the administration of ascorbic acid. The results showed that this change could not be assigned to changes in the protein fraction of the plasma or to the calcium and magnesium content, although magnesium showed a tendency to increase. The coagulation ferments showed quantitative changes as follows:

In the cases of decreased coagulation time a decrease of short duration in the thrombin content resulted and was followed by a very definite increase which lasted a long time. Normal cases showing an increase in coagulation time showed a decrease of the ferments but not with any regularity. The antithrombin content was decreased by the administration of ascorbic acid in cases of both increased and decreased coagulation.

Does the content of ascorbic acid in the organs of rats vary with the presence or absence of vitamin A in the diet? [trans. title], L. Randoin, A. Giroud, and C. P. Leblond (*Compt. Rend. Soc. Biol. [Paris], 120 (1935), No. 39,*

pp. 1082–1085).—In normal rats values for ascorbic acid in various organs were relatively high even on a diet deprived of vitamin C. Although important individual differences were found, the average values corresponded closely to those for the same organs and tissues in other species. No notable differences were found between the average ascorbic acid values of the organs of rats receiving vitamin A and deprived of vitamin A.

The fertility vitamin E [trans. title], E. GIERHAKE (*Klin. Wchnschr., 15 (1936), No. 7, pp. 220–222*).—Repeated minimum doses, 25–40 mg. of vitamin E concentrate, prepared according to the method of Evans and Burr (E. S. R., 58, p. 595) and fed to female rats which previously on a vitamin E-free diet showed characteristic infertility, were required to produce living young. Only 3 control female rats which produced young on a normal diet and 4 experimental female rats were used in this investigation. A large series of experiments were suggested as necessary to rule out the nutritive qualities of the different vitamin preparations used in the diet, but the author, basing his statement on the experimental evidence of others, concluded that vitamin E as an indispensable nutrient factor directing in a specific way intrauterine fetal development was no longer questionable. Medical vitamin E therapy is suggested.

TEXTILES AND CLOTHING

Fabrics, G. G. DENNY (*Chicago: J. B. Lippincott Co., 1936, 4. ed., rev., pp. XIV+178, figs. 64*).—In this new and enlarged edition of a book first published in 1923 (E. S. R., 54, p. 697), definitions of fabrics and terms relating to fabrics are listed alphabetically with illustrations. The remainder of the book deals with textile testing and fabric analysis, classification of fabrics with trade names, and the standards for labeling. Books of reference on textile fabrics are included.

A study of the adhesion of microbes on certain fabrics used for children's clothing, K. KLINDEROVÁ and L. MLČOCHOVÁ (*Trav. Inst. Hyg. Pub. Tchécoslov., 5 (1934), No. 3, pp. 117–127, pls. 2*).—The purpose of this study was to determine one factor in judging the most suitable fabrics for children's clothes from a comparison of the number of bacteria adhering to the material. The 13 fabrics tested included four kinds of fiber—wool, cotton, linen, and rayon—and three different weaves—plain, twill, and satin. The experimental study was done under conditions similar to those in which dust and bacteria cling to children's clothes by direct contact. Cultures of *Staphylococcus aureus* were diluted, mixed with sterilized dust, dispersed on small glass plates, and incubated until the dust suspension was dry. Small squares of the starch-free fabrics were pressed on the plate surface and then removed and placed in bottles with bouillon. After inoculation with agar and a 24-hr. incubation period, staphylococcus counts were made, and the fabrics were classified into three groups on the basis of bacterial content. The group I fabrics caught 240–500 bacteria per square centimeter, while the count for the group III fabrics was about three times as great. Group I included wrinkle-proof rayon, rayon twill, medium grade voile, dress linen, and outing flannel (due to the bactericial effect of the dye in the fabric, different results being obtained with uncolored outing flannel). Group II fabrics included those washable materials not in group I, cotton Panama, Oxford cloth, printed percale, and cotton twill. The fabrics showing the highest count per square centimeter were in group III, wool serge, cotton sateen, corduroy, and medium grade velvet.

Comparing these results with those of a technological analysis of the fabrics, the number of bacteria adhering to the fabric was found to be in direct proportion to the weight of the fabric and in indirect proportion to the yarn twist and the length of the fiber. "An ideal material for children's wear would be

a fabric which would sufficiently isolize heat and would allow the adhesion of the least number of microbes." It is difficult to find a fabric which will fulfill all of the hygienic requirements.

Clothing: An introductory college course, A. Latzke and B. Quinlan, edited by B. R. Andrews (*Chicago: J. B. Lippincott Co., 1935, pp. XIII+418, figs. 191*).—This textbook, on a level suited for college instruction, presents the subject matter dealing with "the applications of the wide field of art to the human figure and to clothing." The material is divided into units dealing with the factors influencing the significance and character of dress design, fitting the fabric to the figure, creating individual dress designs, creating the wardrobe ensemble, clothing for the family, and spending for satisfaction. The appendix covers the equipment and the technics of garment construction. Laboratory exercises accompany each division of the subject matter.

Laundry chemistry: A manual on the chemistry of laundry materials and methods, A. Harvey (*New York: Chem. Pub. Co., N. Y., Inc.; London: Tech. Press Ltd., 1936, 2. ed., rev., pp. VII+118*).—This book is written particularly for the practical laundryman and deals with the application of chemistry to laundry work. The main considerations are the chemistry of laundry materials and the scientific principles underlying the washing operations. The general chemical principles are reviewed in the introduction, followed by concise explanations of the properties of acids, alkalies, salts, water, fats and oils, soaps, bleaching agents, blues, and starches. The author discusses the effects of laundry processes on the textile fibers and the methods of stain removal.

Detergents and detergency, P. B. Mack (*[Natl. Res. Council], Ann. Survey Amer. Chem., 10 (1935), pp. 341–358*).—This chapter presents a survey of the literature on detergents and detergency from the works of investigators in America. The two main types of detergents, "sodium lauryl sulfate" and Igepons, are discussed, and reference is made to the miscellaneous new detergents now on the market. In the absence of a uniform, accurate standard product for practical testing of detergents, the physical and chemical tests have not been standardized. The theories of different workers are noted. The studies now in progress on bleaching agents of the borate and perborate types are summarized.

MISCELLANEOUS

Supplement to laws applicable to the United States Department of Agriculture, 1930, compiled by J. P. Wenchel and M. H. Moore (*[U. S. Dept. Agr., 1936], pp. [2]+65*).—Supplementing an earlier publication (E. S. R., 75, p. 734), this embraces acts and provisions of a permanent character enacted at the Second Session of the Seventy-Fourth Congress, ended June 20, 1936.

Annual Report of [Nevada Station], 1935, S. B. Doten et al. (*Nevada Sta. Rpt. 1935, pp. 38, figs. 4*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-ninth Annual Report [of Vermont Station, 1936], J. L. Hills (*Vermont Sta. Bul. 407 (1936), pp. 35*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Herd improvement data are also included (pp. 14, 15).

Information regarding recent publications (*Kansas Sta. Circ. 179 (1936), pp. 2*).—This circular briefly describes Bulletins 272–274 and Circulars 176–178, all previously noted.

Publications with author index: Classified by series from 1890 to June 30, 1936, B. C. Pittman (*Utah Sta. Misc. Pub. 15 (1936), pp. 44*).—Lists are given of the station publications by series and of reprints of articles by members of the staff.

NOTES

California University and Station.—Recent appointments include the following: Dr. William E. Castle, emeritus professor of zoology in Harvard University, as research associate in genetics to continue his studies of the genetics of rodents; Dr. John M. MacGillivray, research associate in horticulture in the Indiana Station, as assistant professor in truck crops and associate olericulturist; Dr. Thomas E. Weier as assistant professor of botany and assistant botanist vice Dr. H. A. Borthwick resigned; Dr. Robert A. Cockrell as assistant professor of forestry and assistant forester vice H. E. Malmsten resigned; Dr. Horace A. Barker as instructor in soil microbiology and junior soil microbiologist; Dr. Roger H. Gillette as instructor in chemistry and junior chemist; Dr. L. S. McClung as instructor in fruit products and junior bacteriologist in research on wine spoilage organisms and bacteria concerned with olive pickling; Dr. Reese H. Vaughn as instructor in fruit products and junior bacteriologist in a study of the utilization of yeasts of special properties in wine making, together with their biochemical and morphological characteristics; Dr. Margaret L. Maxwell as instructor in home economics and junior home economist, with headquarters at Davis; and Dr. Ernest M. Dickinson, assistant poultry pathologist in the Oregon Station, as junior veterinarian, with headquarters in Los Angeles, to study problems of poultry mortality.

Connecticut [New Haven] Station.—Dr. A. A. Dunlap, assistant mycologist and plant physiologist, has been granted a 4-month leave of absence to carry on research at Johns Hopkins University on the sand culture of seedlings.

Idaho University.—Enrollment in the College of Agriculture has exceeded all previous records, the total increasing from 217 last year to 260.

Iowa College and Station.—A new veterinary clinic building to be known as the Charles H. Stange Memorial Clinic is under construction, with a view to completion next fall. The building will be in the form of a complete quadrangle, with an exterior of brick and an interior of buff tile. The main unit will be a two-story structure 200 by 40 ft., with one-story wings 220 ft. deep and a one-story rear. The cost is estimated at $180,000.

Dr. C. P. Wilsie, agronomist in the Hawaii Station, has been appointed research assistant in forage crops.

Missouri Station.—Experiments carried on in cooperation with the U. S. Department of Agriculture have shown that on the gumbo land in the larger river bottoms of the State small grains alternating with soybeans or lespedeza produce much more total feed per acre than corn and at the same time decrease the necessity of difficult and expensive tillage, since the soybeans loosen and mellow the soil so effectively that grain can be seeded with a drill with little or no additional preparation of the seedbed. The yields that have thus been obtained on the experimental fields have ranged as high as 40 bu. of wheat, 30 bu. of soybeans, 90 bu. of oats, 150 bu. of rice, and 74 bu. of barley per acre. Rice production, though requiring irrigation with water pumped from gravel beds beneath this land, has been highly successful on the one experimental field where it was tried. This field is located farther north than any com-

mercial rice fields in the interior of North America, and suggests the possibilities of rice growing on a large acreage of similar lands.

The station has been given an additional grant of $4,000 by the Herman Frasch Foundation to be used in the publication of a treatise covering the findings of its growth and development research project.

Dr. M. A. Smith of the U. S. D. A. Bureau of Plant Industry is beginning at the station a cooperative investigation of fruit and vegetable diseases.

Nebraska Station.—A new barn costing approximately $1,200 has been erected for the hog unit at the Havelock Farms.

New Hampshire University.—Dr. Fred Engelhardt, head of the department of educational administration of the University of Minnesota, was appointed president on December 10, 1936.

New Mexico College and Station.—W. T. Conway, connected with the institution from 1911 to 1935, died December 2, 1936, at the age of 70 years. A native of Arkansas, he was graduated from Ouachita Baptist College in 1894 and from the Oklahoma College in 1910. From 1914 to 1920 he served as State leader and organizer of boys' and girls' clubs, and from 1920 to 1935 he was assistant professor of agriculture and assistant agronomist.

D. A. Hinkle has been appointed assistant agronomist.

Cornell University and Station.—H. H. Wing, whose retirement in 1928 after 40 years' service in animal husbandry and dairying has been noted (E. S. R., 59, p. 500), died at Little Falls, N. Y., November 21, 1936, aged 77 years.

Dr. Arthur W. Gilbert, assistant professor and professor of plant breeding from 1909 to 1917, died in Cambridge, Mass., on December 7, 1936, at the age of 54 years. A native of Massachusetts and a graduate of the Massachusetts College in 1904, he received the M. S. A. degree from Cornell in 1905 and the Ph. D. degree in 1909. He had also served on the instruction staff of the Maine University from 1905 to 1907, as agricultural secretary of the Boston Chamber of Commerce from 1917 to 1919, and as commissioner of agriculture of Massachusetts from 1919 to 1934. At the time of his death he was adviser on States' relations for the U. S. D. A. Agricultural Adjustment Administration. Widely known as an able organizer and administrator, he was connected with numerous other organizations, serving as chairman of the American committee on the International Institute of Agriculture at Roma and in 1926 as a member of the economics committee of the League of Nations. He was joint author with Dr. L. H. Bailey of Plant Breeding, published in 1914 and just issued.

New York State Station.—Dr. T. W. Reed has resigned as assistant entomologist to engage in commercial work. Recent appointments include Drs. D. H. Palmiter and R. O. Magie as associates in research in plant pathology, Dr. Frank A. Lee as assistant chemist, and A. D. Hess as assistant entomologist.

Vice Director P. J. Parrott is making a survey of agricultural conditions in South Africa, with special reference to fruit pests and the use of refrigeration at low temperatures as a means of disinfection.

Oregon College and Station.—Dr. Arthur B. Cordley, dean emeritus since 1931 and previously connected with the college since 1895, died November 1, 1936. Dean Cordley was born February 11, 1864, in Pinckney, Mich., graduated from the Michigan College in 1888, and was assistant in entomology there from 1888 to 1890. After brief service as an assistant entomologist in the Vermont Station and the U. S. Department of Agriculture, he came to Oregon as professor of zoology and station entomologist. He was director of the station from 1914 to 1920 and dean of agriculture from 1907 to 1931.

North Dakota College and Station.—The department of horticulture has completed a root house for storing breeding stocks of potatoes, nursery stocks,

and other miscellaneous materials in connection with its research work. The inside dimensions of the house are 20 by 36 by 8 ft.

Arland D. Weeks, connected with the institution since 1907 and dean of the School of Education since 1917, died November 13, 1936. Dean Weeks was born in McLean, N. Y., on December 13, 1871, graduated from the Cortland (N. Y.) State Normal School in 1896 and Cornell University in 1901, and received the M. A. degree from the University of Minnesota in 1909. He was the author of a number of books on education, psychology, and other topics, among them The Education of Tomorrow (1913), Social Antagonisms (1918), and Psychology for Child Training (1925).

Utah Station.—Two new projects with sheep have been approved. One of these, germ plasm studies, will be concerned with the transmission of wool characteristics and many body characteristics. Representatives of three breeds (Rambouillet, Hampshire, and Corriedale) will be used. The second project, ewe lamb feeding investigations, is based on the observation that ewe lambs in the southern part of the State frequently fail to make sufficient development to be ready for the breeding herd the following year.

Washington College and Station.—Dr. Paul D. Isham, instructor in horticultural manufactures in the Massachusetts College, has been appointed assistant chemist in the U. S. D. A. Bureau of Chemistry and Soils and assigned to the staff of the fruit and vegetable byproducts laboratory maintained cooperatively by the station and the Department.

Pasture Research in South Africa.—New pasture research stations have been set up in three of the main grassland areas of the Transvaal. These are located at Warmbaths in the bushveld, at Vereeniging on the high veld in the marginal corn-producing area for work in veld management and reclamation, and in the sour mountain grassland at Athole near Amsterdam, where work has been initiated on grazing control, artificial pastures, veld burning, and methods of conservation. At Prinshof attention is hereafter to be confined to the breeding of herbage plants and at Rictondale to the testing of promising native grasses. At the Veld Reserve, Fauresmith, digestion experiments with sheep have been begun.

Association of Official Agricultural Chemists.—Attendance at the fifty-second meeting of this association, held in Washington, D. C., from November 30 to December 2, 1936, again approximated 500.

The address of the president, H. H. Hanson, dealt with the objectives of the organization and the increasing comprehensiveness of its interests, suggesting consideration of a longer period for the annual meetings. The sixth Wiley memorial address was given by a former president, Dr. A. L. Winton, on Structure as an Approach to Food Chemistry. Dr. Winton reviewed the services of microscopy to food chemistry and urged the full cooperation of chemists with this and other branches of science.

Officers for the ensuing year include C. C. McDonnell as president; H. R. Kraybill as vice president; W. W. Skinner, U. S. D. A. Bureau of Chemistry and Soils, as secretary-treasurer; and H. H. Hanson and L. B. Broughton as additional members of the executive committee.

Association of American Feed Control Officials, Incorporated.—The twenty-eighth annual convention of this association was held in Washington, D. C., on December 3 and 4, 1936. The address of the president, C. E. Buchanan, dealt with the objects of the association and its current problems, including the proposed uniform feed law. A considerable number of definitions of feedstuffs were adopted. The vice president of the association, L. S. Walker, was elected president, G. H. Marsh becoming vice president. Reelection followed of

L. E. Bopst of College Park, Md., as secretary-treasurer and G. L. Bidwell as a member of the executive committee.

American Society of Agronomy.—The twenty-ninth annual meeting of this society was held in Washington, D. C., from November 17 to 20, 1936, with an attendance of considerably over 500.

The address of the president, R. M. Salter, was entitled An Agronomist Looks at Land Use. In this he reviewed past attitudes toward land use, suggested attacking the problems now centering around it on the basis of the individual farm, and discussed some opportunities and responsibilities of agronomists in land use matters. In conclusion he addressed the younger members of the society as follows:

"The land use movement is in its infancy. Decades will be required for its fruition. You will approach its problems unencumbered with the traditions of an era of land exploitation. You will be armed with scientific tools of ever increasing sharpness. Your research will be virile because it will deal with problems that are alive. Your satisfactions will be great, because to the joy which comes from expanding knowledge itself will be added the greater joy of seeing this knowledge used for lifting the level of life on the land. You will learn that the interpretation of science, its translation into terms of useful application, calls for as much ability and offers as great rewards as does the acquisition of new facts."

The usual comprehensive program of papers and committee reports was adhered to, and a tentative plan was accepted for next year's consideration, calling for the reorganization of the crops section into three subsections, dealing with (1) breeding, genetics, and cytology, (2) physiology (including nutrition), morphology, and taxonomy, and (3) all remaining phases of crops work. The soils section was formally merged with the American Soil Survey Association to become the new Soil Science Society of America (see below).

Officers for the ensuing year include Dr. F. D. Richey as president, Emil Truog as vice president, P. E. Brown of Ames, Iowa, as secretary-treasurer, J. D. Luckett as editor, and Drs. Richard Bradfield and O. S. Aamodt as additional members of the executive committee. Drs. W. L. Burlison, L. J. Stadler, and S. A. Waksman were made fellows of the society.

Soil Science Society of America.—This society held its first meeting November 18, 1936, completing a merger of the American Soil Survey Association and the soils section of the American Society of Agronomy. A constitution was adopted announcing as the object of the society the fostering of all phases of soil science, and providing for close affiliation with the American Society of Agronomy as to matters of common interest. R. Bradfield was elected president, O. M. O'Neal, secretary, and P. E. Brown of Ames, Iowa, treasurer, and the following as officers of the six sections which were provided: (1) Soil physics, H. E. Middleton, chairman, L. A. Richards, secretary; (2) soil chemistry, S. F. Thornton, chairman, E. E. DeTurk, secretary; (3) soil microbiology, L. M. Turk, chairman, N. R. Smith, secretary; (4) soil fertility, W. H. Pierre, chairman, H. J. Harper, secretary; (5) soil morphology, L. C. Wheeting, chairman, W. E. Hearn, secretary; and (6) soil technology, L. R. Schoenmann, chairman, E. A. Norton, secretary.

About 75 papers were presented and will be published as volume 1 of an annual series of proceedings to be issued early in 1937. The 1937 annual meeting is expected to be held in Chicago, probably from November 30 to December 3.

EXPERIMENT STATION RECORD

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THE 1936 REPORT OF THE CHIEF OF THE OFFICE OF EXPERIMENT STATIONS

Covering the fiscal year ended June 30, 1936, and recently released for distribution, the current report of the Chief of the Office of Experiment Stations is of special interest because of a number of important developments in the administration of research in agriculture and home economics to which it draws attention. Of these, perhaps the most important was the assignment to the Office by the Secretary of Agriculture of the general administration of the Bankhead-Jones Act of June 30, 1935 (E. S. R., 73, p. 289), including not only the Department's relations with the State experiment stations but also the planning and coordination of the research programs of the Department itself under the special research fund which the act provides.

In the words of a memorandum of the Secretary of Agriculture, dated March 16, 1936, "these activities, together with the increased emphasis now being given to the regional approach to major research problems, indicate the necessity of having a central authority in the Department to promote cooperation in the planning and coordination of research, both within the Department and with the States and other agencies participating in agricultural research." To meet this need, the Chief of the Office was also designated Director of Research for the Department. In this latter capacity he was given "general direction of the planning, development, and coordination of the research program of the Department, and will cooperate with the bureaus in the planning and execution of research work. He will continue to be responsible for present activities of the Office of Experiment Stations, including the administration of Federal grants to the States for the agricultural experiment stations, the coordination of research of the States under these grants, and the coordination of such projects with research of the Department along the same lines."

Much progress in these various directions is recorded. Plans were early adopted whereby the Bankhead-Jones allotments to the States, aggregating $600,000 for the year, retained their identity for the

support of definite research projects, carefully outlined and submitted for review and approval by the Office before expenditures were made. According to the report, "the cooperation on the part of the experiment stations was excellent, and from September 1, 1935, to the close of the fiscal year the Bankhead-Jones program of 360 research projects was agreed upon. . . .

"The provision of the act requiring expenditures on the part of each State, Territory, and Puerto Rico from other than Federal sources equal in amount to the allotment for a given year in the Bankhead-Jones Act was met satisfactorily. As indicated, the total funds available from other than Federal sources amounted to over $10,000,000." However, the report makes clear, "in individual States the amount from other than Federal sources is at present much less than the average in comparison with the total funds in such States under the Federal acts, and while sufficient to meet the requirements of the Bankhead-Jones Act for the fiscal year 1936, may be insufficient in future fiscal years unless additional funds from State sources are provided."

Approximately one-sixth of the Bankhead-Jones funds for the fiscal year 1936 was devoted to some 42 State station projects dealing with agricultural economics along the lines of adjustment in production by regions and type-of-farming areas to better meet the changing economic conditions; marketing agricultural products, including methods and practices followed in marketing channels; and soil and water conservation and land use. Another large item, approximately one-sixth of the total, included some 60 projects in connection with animal production, mainly in the fields of nutrition of the larger animals and poultry and largely concerned with the principles and needs of utilization of vitamins and minerals. These researches are mainly of fundamental character, and results should be of broad application. Yet another line of research receiving a relatively large allotment, about $68,000, concerned farm pastures and ranges. Much of this work is coordinated and carried on cooperatively with the Department of Agriculture. In the northeastern region, for example, the State stations have set up projects to deal with certain phases of the pasture problem which are of local nature but which are coordinated with the research program of the regional laboratory located under the Bankhead-Jones Act at the Pennsylvania State College.

"Projects on breeding and production of field crops were allotted about $62,000. These are especially concerned with plant genetics and breeding for improved qualities and varieties. About $40,000 was assigned to projects in animal genetics. This is significant in view of the limited opportunity for thoroughgoing research in this field in the past. It is recognized that progress may be slow in this field. Every attempt has been made to organize the research for

development on a sound basis rather than to attempt too large a program at the beginning."

Meanwhile, the work of the stations supported by other funds went on much as usual. During the year a total of 509 Adams projects and 1,673 Purnell projects were active, and readjustments looking toward increased effectiveness and coordination resulted in 251 new and revised Purnell projects and 63 new and revised Adams projects. Nearly 4,700 projects found support from non-Federal sources, and the total of all active projects was 7,223. These projects provided for research in almost every phase of agriculture and rural life, including land use, soils, and soil and water conservation; crop adjustment; economical production, distribution, marketing, and use of plant and animal products; improvement of the quality of such products; protection against animal and plant diseases, insects, and other pests; tenancy, taxation, and other matters affecting the efficiency of farm business management and the betterment of the rural home and rural life; and improved practices in human nutrition, home management, and other similar research.

As the special research fund for the Department, $392,000 was available during the year. In accordance with the terms of the act, one-half of this was allotted for special research projects of the Department and the remainder for the establishment and maintenance of the regional research laboratories already discussed (E. S. R., 75, p. 1).

The 1936 program for the special research projects included a total of 32 undertakings and involved research workers of 10 bureaus of the Department. Eleven of these were of a short-time nature, but the remainder were of a fundamental character. In their development, "every effort was made to secure effective, cooperative effort of research workers regardless of organization lines. For example, an investigation of grain storage on the farm was undertaken cooperatively by the Bureaus of Agricultural Engineering, Agricultural Economics, and Plant Industry. Since the problems to be met vary in different sections, seven State experiment stations were brought into the research through formal, cooperative agreements. As another example, an intensive, fundamental research concerning plant viruses was undertaken cooperatively by specialists of the Bureaus of Plant Industry and Chemistry and Soils. Projects were undertaken involving like cooperation of the Bureaus of Animal Industry and Dairy Industry and of Agricultural Economics and Dairy Industry. In a similar way cooperation between the Department and outside agencies was developed in several projects in a way to make available for the investigations physical plant facilities and technical skill not available in the Department."

Efforts to plan and coordinate all Department and State station research along sound and productive lines and with particular reference to the immediate requirements of adjustment as well as long-time needs received much attention throughout the year. Various interbureau, regional, and national activities for the purpose were organized, the Office acting as heretofore as intermediary and adviser in most of this work. More than 800 new or revised formal cooperative agreements, covering 731 major research undertakings, were recorded between bureaus of the Department and the stations. All of the State stations and all but one of the Department's research bureaus participated. There were also many informal cooperative agreements, some of which were of major importance. Among the subjects included were those of grain storage on the farm, already referred to, a comprehensive soil conservation research program, a national survey of plant and animal improvement, a nine-State study of wildlife problems, studies of milk marketing in New England and tobacco and cotton diseases, an evaluation of the national cooperative meat investigation, and a regional cooperative program of research on the nutritional status of college women. In numerous other regional and national studies of long-time character the Department cooperated with from 5 to 20 State experiment stations, the total number of the formal cooperative studies per station ranging from 2 to 48.

In these and other ways the report visualizes a steadily increasing integration of research work in agriculture and home economics which is very encouraging. Continued progress in this direction should do much to meet occasional criticisms of duplication of activities. If developed on a basis of willing cooperation and due regard to individual initiative, it should conserve and utilize to good advantage available resources and do much to concentrate and intensify the attack on many fundamental problems.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Effect of salts on the solubility of casein and paracasein, P. F. SHARP and T. J. MCINERNEY (*Jour. Dairy Sci., 19 (1936), No. 8, pp. 573–579, figs. 2*).—The results of an investigation carried out at the [New York] Cornell Experiment Station have shown, in part, that the pH precipitation zone of paracasein is much wider than that of casein; that sodium fluoride, chloride, and iodide increase the alkaline solubility zone of casein, whereas sodium iodide and chloride restrict the alkaline solubility range of paracasein; that sodium fluoride exhibits, with paracasein, an anomalous behavior which is related to its plasticizing action associated with the precipitation of calcium; and that "paracasein in the presence of a suitable concentration of sodium chloride shows solubility zones at pH 2.5, 6.0, and 9.5 and zones of insolubility at pH 1.0, 4.5, and 7.0–9.0."

The texture of Cheddar cheese was affected favorably by the peptizing action of sodium chloride on paracasein in the pH range between 5.5 and 6.0. "The following factors influence the body and texture of processed cheese: (1) Conditions of heating, (2) composition, (3) degree of ripening, (4) pH zone, (5) removal of calcium from paracasein, (6) peptization of the paracasein."

Some physico-chemical properties of lactose.—V, The influence of other substances upon the equilibrium rotation of lactose, B. L. HERRINGTON (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 701–707*).—Continuing a serial contribution (E. S. R., 73, p. 8) from Cornell University, the author reports upon an investigation in which it was found, in part, that "in glycerol solutions the equilibrium mixture of the high and low rotating forms of lactose contains more of the high rotating component than is found in aqueous solutions. The specific rotation of lactose is increased in glycerol solutions but . . . is decreased in alcoholic or acetone solutions. Therefore, it may be assumed that water is not an important factor in determining the ratio of the sugars at equilibrium. This implies that the amount of aldehydrol present in solution is small, or else that its specific rotation is approximately equal to the weighted mean of the rotations of the two anhydrides, taking their equilibrium concentrations into consideration.

"The specific rotation of lactose is altered by the presence of salts. The effect is small in dilute solutions. Changes in the concentration of lactose, or of the salt, result in shifts of the equilibrium rotation which are in agreement with the theory that molecular compounds are formed in salt solutions."

The isolation of pyruvic acid from the blood of vitamin B_1-deficient pigeons, R. E. JOHNSON (*Biochem. Jour., 30 (1936), No. 1, pp. 31, 32*).—The author gives a method of isolating pyruvic acid in the form of 2,4-dinitrophenylhydrazone from the blood of vitamin B_1-deficient pigeons. This test may be used to identify vitamin B_1 deficiency in pigeons, since the presence of pyruvic acid in normal pigeon blood cannot be definitely established.

Standard methods for the examination of water and sewage, A. WOLMAN, M. PIRNIE, and H. E. JORDAN (*New York: Amer. Pub. Health Assoc., 1936, 8. ed.,*

pp. XIV+309, figs. 9).—In a further revision (E. S. R., 69, p. 330), the authors have modified boiler-water methods, included simplified procedures for parts of the bacteriological work, included a centrifugal concentration method in the procedure for microscopic examination, rewritten the sections on turbidity, odor, and chloride content, and added to the section of provisional methods.

Estimating exchangeable calcium and other cations in soils, A. N. Puri (*Soil Sci., 42 (1936), No. 1, pp. 47–59*).—A new method of estimating exchangeable Ca in calcareous soils is described in which the procedure consists in shaking the soil with 0.05 N Na_2CO_3 in N NaCl. The decrease in the concentration of CO_3 ions is equivalent to the exchangeable Ca in the soil. The importance of the method in supporting the chemical theory of soil colloids and its bearing on the cause of barrenness in alkali soils are pointed out.

"Exchangeable Ca in calcareous soils can also be determined by shaking a known weight of the soil with a definite mixture of potassium or ammonium oxalate-acetate-carbonate. In this mixture $CaCO_3$ is insoluble, and the decrease in the concentration of oxalate ion is equivalent to exchangeable Ca. Soils containing gypsum require a preliminary treatment with excess $BaCO_3$, when the $CaSO_4$ is converted into $BaSO_4$ and $CaCO_3$ and thus rendered insoluble."

Factors affecting the determination of available phosphorus in calcined phosphate and other water-insoluble phosphates, K. D. Jacob, L. F. Rader, Jr., and T. H. Tremearne (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 3, pp. 449–472*).—This contribution from the U. S. D. A. Bureau of Chemistry and Soils reports the results of a study of the solubilities of calcined phosphate (prepared by heating phosphate rock at high temperatures in the presence of water vapor), basic slag, and other water-insoluble phosphates in ammonium citrate and citric acid solutions, as affected by various details of the analytical technic.

"When the determinations are made according to the Official Method, the results for citrate-insoluble phosphorus in calcined phosphate and certain of its possible components, basic slag, and Rhenania phosphate and similar products obtained by heating phosphate rock with alkali salts, are significantly lower when filter paper is present during the citrate digestion than when it is absent; asbestos fiber has a similar effect. This . . . seems to be merely a mechanical effect. The fibrous material probably tends to prevent the agglomeration of the phosphate particles and to facilitate the contact between the solid and the solvent. The Official Method for the determination of citrate-insoluble phosphorus in 'nonacidulated' samples should definitely specify either the omission or the inclusion of filter paper in the citrate digestion. . . .

"The solubility of calcined phosphate in neutral ammonium citrate solution is markedly affected by the particle size of the material, at least within the range of 20- to 200-mesh (0.833 to 0.074 mm). The effect is greatest in the coarser particles. Grinding the sample finer than about 80- to 100-mesh has comparatively little effect on the citrate solubility of the phosphorus when the analyses are made on the composite samples. Particle size has far less effect on the citric acid solubility than on the ammonium citrate solubility of calcined phosphate.

"In general, variations in the analytical procedure have less effect on the solubility of phosphates in 2 percent citric acid than in neutral ammonium citrate solution. The behavior of calcined phosphate in both solvents is similar to that of basic slag."

Notes on the permanganate method of estimating reduced copper in the determination of reducing sugars, H. R. Kraybill, W. J. Youden, and J. T. Sullivan (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 1, pp. 125–130*).—A study is reported leading to the following findings:

"Standardization of the permanganate solution for the estimation of reducing sugars with cuprous oxide or sodium oxalate yields values in close agreement. Too high values will be obtained with cuprous oxide if extreme care is not taken to insure complete solution of the cuprous oxide. To determine accurately the reduced copper by means of the permanganate titration method it is necessary to secure complete solution of the cuprous oxide in the ferric ammonium sulfate and to obtain the correct end point of the titration. The standardization of the permanganate solution with sodium oxalate does not give results that are too low in the estimation of reducing sugars, as is reported in the literature. When permanganate that was standardized against sodium oxalate was used in the determination of reduced copper in the estimation of reducing sugars, values in close agreement with those obtained by the electrolytic method resulted."

The determination of copper in the organs [trans. title], Z. GRUZEWSKA and G. ROUSSEL (*Compt. Rend. Soc. Biol.* [*Paris*], *120* (*1935*), *No. 38*, *pp. 934–936*).—The method employed to determine the copper present in the liver is based on the precipitation of copper by α-nitroso-β-naphthol. The reaction is not affected by the presence of other mineral substances such as lead, zinc, aluminum, magnesium, and calcium, but care must be taken to remove all iron from the solution. The quantity of copper is deduced by calculating the weight of the copper oxide obtained from the 4.5–5 g of fresh liver. The results given in tabulated form show the amount of copper in the livers of adult rats, as well as in solutions of copper sulfate alone or in the presence of iron. The authors conclude from these data that in the analysis of copper in solutions containing other minerals this method gives satisfactory results. A retest by another process should be conducted when analyzing organs for copper. The water-soluble ash of adult rabbit liver does not contain copper, which seems to indicate the presence of a complex in which the copper is bound in the liver.

The determination of moisture in powdered milk by the toluol distillation method, E. C. THOMPSON and R. S. FLEMING (*Jour. Dairy Sci.*, *19* (*1936*), *No. 8*, *pp. 553–559*, *fig. 1*).—This paper describes a series of trials in which the results of moisture determinations of milk powder samples by the vacuum oven method and the toluol distillation method are compared. It is shown that by using from 30- to 50-g samples of milk powder with a distillation time of from 60 to 75 min. the toluol distillation method gives results comparable with, and no more variable than, those by the oven method and may be considered entirely satisfactory. For the sake of uniformity the 50-g sample is recommended. The advantages of the toluol method are discussed.

The determination of lactose and glucose in milk, T. S. G. JONES (*Jour. Dairy Res.* [*London*], *7* (*1936*), *No. 1*, *pp. 41–46*, *fig. 1*).—The author determined the total reducing-sugar content of milk by a copper reduction-iodometric method after precipitation of the proteins by means of a tungstic acid reagent, attributing a precision of ±0.36 percent to this determination. He found that washed yeast neither fermented the lactose nor added copper reducing substances to the tungstic acid filtrates upon which the sugar determinations were made. The reducing substances removable by yeast could be determined with an accuracy of ±3 percent.

The fluorometric estimation of lactoflavin, G. C. SUPPLEE, S. ANSBACHER, G. E. FLANIGAN, and Z. M. HANFORD (*Jour. Dairy Sci.*, *19* (*1936*), *No. 3*, *pp. 215–220*, *pls. 3*).—The authors report the preparation of pure, crystalline lactoflavine from a water-soluble vitamin concentrate derived from milk and the elaboration of a method of estimating lactoflavine by means of its fluorescence under ultraviolet radiation. "The method is simple, involving only standard lactoflavine solutions and an ultraviolet light generator [carbon arc] equipped with

a suitable filter [a glass filter 4 mm thick, transmitting from 310 mμ (max. at ca. 365 mμ) to 410 mμ and very slightly in the red, at about 720 mμ]. The method was found to be accurate to 0.7γ of lactoflavine, but concentrations as low as 0.05γ/ml of lactoflavine could be detected."

Spectrophotometric determination of chlorophyll a, chlorophyll b, carotene, and xanthophyll [trans. title], A. SPRECHER VON BERNEGG, E. HEIERLE, and F. ALMASY (*Biochem. Ztschr., 283 (1935), No. 1-2, pp. 45-52, figs. 9*).—The authors have found it possible to determine spectrophotometrically, to an accuracy of 5 percent, the four pigments named when all are present in the extract of 200 sq. cm of leaf surface. The extracts were prepared by treating the leaf material with acetone and adding ether and water to the acetone solution of the pigments so that they were brought together in the separated ether layer. Because of the effect of solvents on the absorption curves of the coloring matters, solutions of the pure pigments used in obtaining the standard absorption curves were prepared with the same series of solvents.

Conditions of the reaction of silver nitrate as a test for ascorbic acid [trans. title], A. GIROUD, C. P. LEBLOND, R. RATSIMAMANGA, and M. RABINOWICZ (*Compt. Rend. Soc. Biol. [Paris], 120 (1935), No. 38, pp. 967, 968*).—This is a report of a method of testing based on the power of ascorbic acid to reduce silver nitrate. The reduction depends on a number of factors and fluctuates according to the quantity of ascorbic acid present. The sensitivity is very great in vitro and is less in vivo. It has been demonstrated to disappear entirely in vitamin C-deficient animals and to reappear on revitaminization. A reaction takes place even in the presence of substances that limit the reducing power of the ascorbic acid. The authors have not distinguished any modification of the reaction following large injections of glutathione. This reaction with silver nitrate permits approximate evaluation of the ascorbic acid content in the organs, reveals the localization of that substance, and gives information on the possible reducing activity of the ascorbic acid in the tissues.

Flax studies.—II, An improved refractometric method for estimating the oil content of flaxseed, W. F. GEDDES and F. H. LEHBERG (*Canad. Jour. Res., 14 (1936), No. 1, Sect. C, pp. 48-61, figs. 3*).—Continuing this series (E. S. R., 76, p. 32), the authors found that the method based upon the change in refractive index of halowax, an impure substituted monochloronaphthalene, on dilution with linseed oil extracted from the ground sample, is improved by drying the sample before extraction, grinding in a Hobart mill, filtration for 15 min., and the use of a special refractometer with illumination by a 40-w light. "The use of 4 cc of solvent and extraction at 70° C. was confirmed. The correlation between halowax extract scale reading and oil content as determined by ethyl ether extraction was 0.95. The standard error of prediction of oil content by the refractometric method was 0.59 percent. The refractometer readings were not appreciably affected by variations in the refractive index of linseed oil as determined on the ether extract. The correlation between the refractive index and the iodine value of the ether extract was 0.70 with a standard error of prediction of 3.1 units.

"Further improvement is obtained by the use of a solvent consisting of approximately 50 percent by volume of halowax and α-bromonaphthalene which gives a standard error of prediction of 0.39 percent. By slight changes in the proportions, the refractive index of this solvent may be adjusted to a constant value, permitting the use of a permanent conversion chart. Addition of anhydrous sodium sulfate during the extraction obviates the necessity of preliminary drying. With the modifications indicated, the method is suitable for routine determinations on large numbers of samples."

The photoelectric turbidimeter and the alkaline titration method for the determination of small amounts of hydrocyanic acid, E. T. BARTHOLOMEW and E. C. RABY (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 3, pp. 472–476*).—An investigation reported from the California Citrus Experiment Station has shown that "the photronic photoelectric turbidimeter can be used accurately and rapidly to determine small amounts of hydrocyanic acid distilled from macerated flaxseed meal. Difference in temperature of maceration within the range 20° to 34° C. had no apparent effect on the amount of hydrocyanic acid extracted. Hydrocyanic acid was lost by volatilization during maceration when an open distillation flask was used as a macerating vessel. More hydrocyanic acid was extracted from macerated flaxseed meal by steam distillation than by the use of acid plus steam. Treating the distillates with lead carbonate prevented the darkening of the solution during titration and permitted a sharper determination of the titration end point."

The freezing preservation of fruits, fruit juices, and vegetables, D. K. TRESSLER and C. F. EVERS (*New York: Avi Pub. Co., 1936, pp. X+369, figs. 69*).—This book does not attempt to provide detailed directions for commercial freezing operations, but is intended rather "to present the broad general principles of the selection of raw material of the proper variety and maturity, and of its preparation, freezing, storage, handling, and preparation for the table."

The 16 chapters take up the principles of refrigeration; cold storage, sharp freezers, and sharp freezing; quick freezing and quick freezing systems; changes occurring during the preparation, freezing, cold storage, and thawing of fruits and vegetables; packaging materials and problems; adaptability of fruits to freezing; the preparation for freezing and freezing preservation of fruits; frozen fruits for ice cream; the preparation of fruit juices; the freezing of fruit juices; adaptability of vegetables and vegetable varieties to freezing; the preparation and freezing of vegetables; the storage, transportation, and marketing of frozen fruits and vegetables; the nutritive values of frozen fruits and vegetables; the cookery of frozen fruits and vegetables; and the problems of the industry—its future. An appendix adds 10 tables of thermal data bearing upon the subject of the freezing of miscellaneous food products and materials, a subject index, and other data.

[Fruit preservation and uses] (*Georgia Sta. Rpt. 1936, pp. 26, 32, 38, fig. 1*).—The report contains notes on fruit preservation, utilization of pimiento waste, and jelly and wine from muscadine grapes.

Splitting of cherries in brine, W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 9, pp. 271, 272*).—An investigation at the University of California has shown that "in storage solutions containing considerable amounts of dissolved calcium salts cracking was severe at pH 3.1, slight at 3.3, and absent at 3.5; the pH values taken colorimetrically after 6 months' storage. "When the pH values were taken on freshly prepared solutions of $CaSO_3$ plus HCl and $Na_2S_2O_5$ and acid, cracking was found not to occur at pH values of 2.25 and 3.7, respectively, but was severe to very severe at pH 1.6 and 1.2. Calcium salts as such failed to prevent cracking in strongly acid SO_2 solution; that is, in 0.6 percent SO_2 plus 0.3 percent $CaCl_2$ cracking was severe, whereas in 0.6 percent SO_2 plus 0.3 percent $Ca(OH)_2$ there was no cracking. The pH values were 3.1 and 3.9 (after 6 months' storage).

"Evidently then, the Ca ion is not the cracking-preventive factor, but rather cracking is due to too high acidity, that is too low pH values. If the pH is taken after 6 months' storage the critical pH, below which severe cracking occurs, appears to be between 3.1 and 3.3; none occurred at 3.5.

Taken on fresh solutions, the critical pH appeared to lie between 2.25 and 3.0 for $CaSO_4$ plus acid."

Improvements in the manufacture and the preservation of grape juice, C. S. PEDERSON and D. K. TRESSLER (*New York State Sta. Bul. 676 (1936), pp. 29, figs. 11*).—The preparation of grape juice is described. It is noted particularly that the pasteurization both for carboy storage and for bottling may be carried out at from 165° to 170° F. if care be taken to remove the foam and suspended solids and to sterilize properly the corks as well as the containers. The main causes of deterioration of grape juice are ascribed to the action of micro-organisms, the effect of enzymes, and the effect of air. Deterioration due to growth of micro-organisms or to enzyme action was shown to be overcome by proper pasteurization and handling. Harmful effects due to air could be retarded considerably by eliminating air from the bottle and by proper storage of the juice. This was accomplished most easily by filling the bottles full at temperatures slightly above the pasteurization temperature. Methods for removing argols or crude tartrates are described, reference being made especially to such rapid methods as the use of "Pectinol" clarification and freezing and thawing procedures. The carbonation of grape juice is discussed, and a method of carbonating by the use of "dry ice" is briefly described.

Early experiments in preservation of orange juice, W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 6, pp. 164, 165*).—A note contributed from the University of California briefly summarizes experiments on bitterness in bottled orange juices (a fault shown to be associated with the stage of ripeness, in that juice from early pickings became very bitter, that from a later picking only slightly bitter, and that from ripe fruit not bitter at all), clarification, browning of the bottled juice (preventable either by small quantities of sulfur dioxide or by a suitable pasteurization), cloudy juice, vacuum treatment, and other phases of the preservation treatment.

Cranberry pectin properties, G. L. BAKER and R. F. KNEELAND (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 9, pp. 271–273, 279, figs. 2*).—In an investigation reported from the Delaware Experiment Station, jellies made from the heat-extracted juice of the cranberry showed a definite correlation between jelly strength and viscosity of extracted juice. Maximum strength of jellies appeared between 38 and 41 percent of sugar. It was found that the viscosity of 0.5 percent solutions of cranberry pectin is an index to its sugar-supporting capacity, and that this index of sugar-supporting capacity is in closer agreement with apple pectin solution requirements than with those of solutions of lemon pectin. Differences are thought to be due partly to the fruit salts present.

The treatment of apple pomace for pectic extraction, G. L. BAKER (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1934), No. 4, p. 110*).—Experiments carried out at the Delaware Experiment Station have shown that apple pomace extracted with alcohol immediately after expressing the cider, pressed at 10,000 lb. per square inch or less, and air-dried, keeps well without cold storage and yields more pectin than does commercial kiln-dried pomace. Attention is called to the fact that "the increase in cost of the solvent treatment will probably be saved in drying cost. The solvent can of course be recovered."

The effect of sulphurous acid on apple pulp pectin, N. V. SABOUROFF and M. I. KALEBIN (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 9, pp. 275–277, 280, 283*).—After a storage period of 6–8 mo. the pectin of fruits preserved by adding 0.1 percent of sulfur dioxide and preheating showed a very good jellying power. Similar results were obtained in experiments with apple pomace. It is considered that such a method of preserving of raw material

will find considerable practical use. Without any preheating, however, the storage of fruits preserved with a 1 percent concentration of sulfur dioxide has been observed to result in heavy destruction of pectin.

"It is evident from this that raw material which is being preserved with SO_2 for later use in the pectin or confectionery industry should always be preheated in order to prevent any enzymatic splitting of pectic substances. On the other hand . . . the quantitative standardization of the use of sulfurous acid in the preserving should be rather strict since the higher concentration of SO_2 results in some decrease of the jellying power of pectin."

Imitation jelly from dried apple pomace, G. L. BAKER (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 2, pp. 44, 45, 55*).—On the basis of practical experiments carried out at the Delaware Experiment Station, the author describes the methods to be followed in evaluating the pomace, the optimum conditions of extraction, and the proportions to use. It was found that when the manufacturing process was carried out in accordance with the methods outlined, the finished jelly will contain only about 0.5 percent pectin and the jelly will be elastic, clear, and light enough to take a delicate coloring, if necessary. Operating costs will be very low.

Fruit "wines", W. V. CRUESS, G. L. MARSH, and S. MENDELS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 10, pp. 295–298*).—On the bases both of specific experiments recently carried out at the University of California and of general practice in the manufacture and handling of true (grape) wines, the authors discuss the commercial production of "wines" from various fruits, reaching the conclusion that "in making hard ciders or wines from berries, citrus fruits, cherries, table apples, pears, and most other fresh fruits the addition of sugar is necessary in order to attain fermented beverage of pleasing 'balance' in alcohol content and acidity and of good keeping quality. The addition of SO_2 or metabisulfite to check wild yeasts and bacteria is also advisable. Pure yeast of a selected strain is also desirable. Dry, unfortified sweet, and fortified fruit wines were made in our tests successfully.

"However, after all is said and done we cannot say that we see any great need for these fruit wines when there is such an abundance of fermented products of the grape of good quality available at moderate price. True wine is the fermented juice of the grape, and when properly made we believe it has no peer among the wines made from other fruits."

The microbiology of wine-making, H. E. GORESLINE (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 7, pp. 196–198, 215, 219*).—A contribution from the U. S. D. A. Bureau of Chemistry and Soils discusses, largely from the standpoint of conditions existing in New York State, the selection and processing of grapes and must, the fermentation, the storage and aging, and the bottling and holding of wine; the natural flora of the grapes and its significance in wine making, the treatment of the must, the control needed to secure desirable fermentations, and the methods used to discourage the growth of undesirable micro-organisms which spoil wine; the sanitary measures necessary to the care of equipment, casks, etc.; and the importance of proper treatment of wine both before and after bottling.

The Semichon process of fermentation, L. QUACCIA (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 6, p. 169*).—A note contributed from the University of California outlines the method named, pointing out that, whereas wild yeast and some bacteria are well controlled, the tourne disease (E. S. R., 74, p. 592) and vinegar organisms are not always inhibited.

"We do not recommend the method unmodified, but feel that if 75 to 100 p. p. m. of SO_2 (1¼–1½ lb. of metabisulfite per 1,000 gal.) were used to pre-

vent growth of tourne bacteria, the method might prove useful in wineries not equipped to cool during fermentation. However, without addition of SO_2 or metabisulfite to the must we fear that the danger from tourne would outweigh any probable advantages."

Pasteurization of wines, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 2, pp. 40, 41*).—Pasteurization is discussed in the present contribution from the University of California mainly as a means, in several respects preferable to the use of sulfur dioxide, for the preservation of wines of low alcohol content and sweetened by the addition of grape concentrate sufficient to bring the specific gravity up to about 3° Balling. Directions are included.

Preservation of bottled Sauterne wines, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 8, p. 228*).—Objecting to the preservation of wines of the type named by means of sulfur dioxide on the ground that "there is no doubt that it masks or destroys some of the fruit flavor and bouquet of the wine", the author of this contribution from the University of California prefers pasteurization in the bottle at 140° F. for 30 min.; wines which cloud on heating in the bottle being subjected to bulk pasteurization, to filtration or clarification before bottling, and to pasteurizing in the bottle.

A note on spoilage of sweet wine, H. C. Douglas and W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 10, p. 310*).—A very brief note from the University of California calls attention to the occasional occurrence in fortified sweet wines of a filamentous micro-organism causing a spoilage of the wine and appearing as "a heavy moldlike sediment." The organism has been isolated. It is very easily controlled in wines by sulfur dioxide in a concentration of 60 p. p. m. or by an acidity, calculated as tartaric acid, of 0.5 g per 100 cc.

AGRICULTURAL METEOROLOGY

Manual of meteorology.—Vol. II, Comparative meteorology, N. Shaw and E. Austin (*Cambridge, Eng.: Univ. Press, 1936, vol. 2, 2. ed., rev., pp. XLVIII+472, figs. 228*).—This is a revision of the first edition of this volume of the manual, which appeared in 1928 (E. S. R., 60, p. 113).

Weather governed by changes in the sun's radiation, C. G. Abbot (*Smithsn. Inst. Ann. Rpt., 1935, pp. 93–115, pls. 3, figs. 16*).—Reviewing the evidence with regard to dependence of the weather on periodical changes in solar radiation, the author concludes that "on the whole, the relationship does not seem unreasonable and leads us to the remarkable conclusion that an important and perhaps a major part of the departures from normal, which make up weather as distinguished from climate, originate in these newly discovered variations in the radiation of the sun. If so it is clear that long range weather prediction is impossible if based solely on the earth's conditions, excluding solar variation as a factor."

Iowa precipitation studies (*[Ames]: Iowa State Planning Bd., 1935, pp. [6]+15, pls. 68*).—By means of maps and charts and interpretative notes based on U. S. Weather Bureau data, this report, which is the first of a series on precipitation, flood, and reservoir studies, shows the amount, distribution, frequency, and intensity of rainfall in Iowa. "These studies have led to the conclusion that Iowa records are not of sufficient length to permit reliable deductions as to the existence of definite trends nor are variations in precipitation sufficiently regular to justify their being considered cyclic." However, "it seemed reasonable that precipitation experience could be considered uniform over quite extended areas in Iowa without significant error."

Gambling with frost in Rogue Valley, F. D. YOUNG (*Rogue River Val. Pear-O-Scope, 4 (1936), No. 6, p. 3*).—Attention is called to the risk of attempting to grow pears without frost protection in the way of orchard heaters.

The author says that "if you want to gamble with the frost damage, the percentage in your favor is much higher during or prior to full bloom than it is after the petals begin to fall. Don't gamble with Bosc at any stage, but especially not after the blossoms have reached the white stage before opening."

Vernalization in agricultural practice, P. S. HUDSON (*Jour. Min. Agr. [Gt. Brit.], 43 (1936), No. 6, pp. 536–543*).—Vernalization, which is stated to be a new method of treating plants to induce earlier maturity, based on a theory of plant development proposed by T. D. Lysenko, is discussed from the standpoint of scientific soundness and practicability on a considerable basis of scientific evidence. It is indicated that this method may prove of use "in the realm of market gardening for forcing early or out-of-season vegetables, salad plants, and possibly fruits. It may also provide a method of producing seeds from herbage plants in the sowing year, particularly from the bred 'pasture' types which normally produce a reduced number of flowering heads. Its application to these plants and to many biennials such as sugar beet, the Brassicas, lettuce, and others should be of interest to seed merchants."

Environment and life in the Great Plains, F. E. CLEMENTS and R. W. CHANEY (*Carnegie Inst. Wash. Sup. Pub. 24 (1936), pp. 54, pls. 10, figs. 2*).—Discussing among other topics the climatic cycle as a factor in environment and life on the Great Plains, the author says: "The newer concept of climate regards it as a continuous series of pulsations of varying degree of magnitude and duration. . . . Consequently, the climatic cycle becomes the master clue to the manifold interactions of environment and life, whether these take place in nature or under the direct or indirect influence of man. . . . Man will never be master of his environment and hence of his destiny until be understands the universal ebb and flow of processes and compels these to his own advantage. Though the great earth movements and shifts of climate are beyond his control, the ultimate consequences in terms of rain and drought, erosion and flooding, security or disaster are in his hands if he has but the wit to command them."

Monthly Weather Review, [July–August 1936] (*U. S. Mo. Weather Rev., 64 (1936), Nos. 7, pp. 227–257, pls. 8, figs. 12; 8, pp. 259–286, pls. 9, figs. 9*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 7.—Charles Fitzhugh Talman, 1874–1936, by W. J. Humphreys (p. 277); Diurnal Distribution of Rainfall at St. Joseph, Mo., April to October, by W. S. Belden (pp. 228–230); Heaters to Prevent Frosting of Theodolite Lenses at Low Temperatures, by G. Grimminger (p. 230); Analysis of Rains and Snows at Mount Vernon, Iowa, 1935–36, by N. Knight (p. 231); Sea Swells in Relation to Movement and Intensity of Tropical Storms, by I. R. Tannehill (pp. 231–238); Tropical Disturbances, July 1936; by J. H. Gallenne (pp. 238, 239); and Duststorms of July 1936 in the United States, by R. J. Martin (p. 239).

No. 8.—Physical Factors Affecting the Visibility of Small Smoke Columns, by G. M. Byram (pp. 259–264); Destructive Easterly Gales in the Columbia River Gorge, December 1935, by D. C. Cameron and A. B. Carpenter (pp. 264–267); and Tropical Disturbances, August 1936, by W. E. Hurd.

SOILS—FERTILIZERS

Pedology, J. S. Joffe (*New Brunswick, N. J.: Rutgers Univ. Press, 1936, pp. XVI+575, pl. 1, [figs. 49]*).—According to the last paragraph of C. F. Marbut's introduction, "Professor Joffe's book is a treatise on soils and their development. It is not a discussion of soil productivity. It concerns the development under the influence of environmental conditions of the outer layer of the earth's crust. It concerns that part of the earth's crust which is itself both the product and the indispensable support of organic life on the earth." The author gives a further indication of his viewpoint in the statement, in his own foreword, of his belief "that a pedological perspective is imperative for the rational approach to the problems of soil productivity. Soil genesis, as expounded by pedology, is the cornerstone on which the applied sciences in agriculture are to be built."

The pioneer work of V. V. Dokuchaev on soil genesis, together with much other scattered work of Russian pedologists, largely unavailable because of the language difficulty, is brought together and presented in an organized form in this book and related to the work of western Europe and of the United States.

The contents of part 1 ("soil genesis") are: Pedology as a scientific discipline; soil as a natural body; soil defined, soil morphology, and methods of studying it; soil genesis—weathering and soil formation; soil genesis—soil formers; and soil genesis—soil-forming processes. Part 2 ("soil systematics") contains: Desert, semidesert, and arid steppe types of soil formation—Gray, Brown, and Chestnut Brown soil zones; Chernozem type of soil formation; Podzol type of soil formation; subtypes and transition types of soils in the Podzol zone; Tundra type of soil formation; Laterites and lateritic type of soil formation; intrazonal soils—Solonchak, Solonetz, Solodi, Rendzina, etc.; bog and marsh soils; mountain soils; and some pedological features of the soils of the United States.

A selected list of books on soils and author and subject indexes complete the volume.

Soil Survey of Iowa.—Report 78, P. E. Brown et al. (*Iowa Sta. Soil Survey Rpt. 78 (1936), pp. 64, figs. 19, map 1*).—In addition to the survey data already recorded in the Federal soil survey report for Monroe County (E. S. R., 73, p. 748), there are included results of field and greenhouse experiments on the fertility and the needs of the county soils.

Soils in relation to fruit growing in New York.—IX, Tree behavior on important soil profiles in the Newfane-Olcott area, Niagara County, J. Oskamp (*[New York] Cornell Sta. Bul. 653 (1936), pp. 20, figs. 17*).—Comparing the study of the orchard soils of Niagara County here recorded with those previously carried out in Monroe (E. S. R., 69, p. 53), Wayne, and Orleans Counties (E. S. R., 74, p. 11), the author points out that "the same general profile characteristics in relation to orchard development have been found to hold true wherever studies have been made. This relationship can be described as follows:

"(1) Those soils with a generally brown profile lacking sharp contrasts in color, with a fairly uniform texture, particularly without a heavy layer in the subsoil, are productive fruit soils where trees are large for their age, long-lived, and deep-rooted.

"(2) Those soils with a gray layer, a very mottled subsoil, or both, are unproductive fruit soils, and trees are smaller, shorter-lived, and shallower-rooted.

"(3) Between these two classes are soils which show some grayness and mottling but not extreme, and which under certain conditions of topography, internal drainage, and proximity to well-defined drainage ways may be moderately well adapted to fruit.

"(4) Another class of soils, usually with a nearly level to depressional topography, a black topsoil, a sharply defined gray layer, and a highly mottled subsoil are unfit for fruit purposes, and except in the most favorable cycle of seasons will not grow an orchard to normal maturity without serious loss of trees.

"(5) Lastly there are those soils largely of unmodified glacial-till origin and those in which unmodified till occurs at a shallow depth, which because of their compaction are unfavorable to root penetration, leaving the tree at the mercy of the temporary fluctuations in moisture and nutrient supply in the surface 2 or 3 ft. of soil. It is very difficult, if not impossible, to judge the compaction of this material by the borings from a soil auger, because it seems loose and friable when taken from the auger. A fresh excavation, however, or the use of a California soil tube [E. S. R., 61, p. 503] reveals the compaction. By means of this instrument samples can be procured which are practically undisturbed soil as found in place. Where there is danger of some compaction by the tube itself in driving, it is put down only a foot or less at a time."

Some factors which modify the rate and total amount of infiltration of field soils, G. W. Musgrave and G. R. Free (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 727–739, figs. 5*).—The authors of this contribution from the U. S. D. A. Soil Conservation Service used for the infiltration-rate determinations here recorded metal cylinders 6 in. in diameter and from 14 to 18 in. long jacked into the soil to be studied in such a manner as to provide for the experiment a soil column from 12 to 16 in. deep. Water was supplied from 1,000-cc self-dispensing burettes set at a level such as to maintain a constant head of about 0.25 in. of water. The Marshall and Shelby silt loams, readily permeable and relatively impermeable, respectively, were the soils examined.

"Of the various factors which may modify the rate of infiltration of water into field soils, the percentage of porosity is one of the most dominant. Increasing the average percentage of pore space of cores of field structure through surface cultivation has markedly increased the rate of infiltration. . . . On Marshall silt loam the average rates over a 3.5-hr. period were as follows: Without cultivation 0.78 in. per hour, with 4-in. cultivation 0.99 in. per hour, and with 6-in. cultivation 1.23 in. per hour. During the first 30 min. following the application of water to Marshall silt loam the effects of cultivation were quite pronounced. After this initial period, however, the effects of increased porosity induced by cultivation diminished rapidly. On the Shelby silt loam, however, the effect persisted about 1.5 hr., or approximately 3 times as long as on the Marshall. Over a 3.5-hr. period following the initial application of water the rates for the two soils were rather similar, the ratio of Marshall to Shelby for the period being about 1.5 : 1. For the latter part of this period of operation, however, the rates diverged widely, averaging about 9.1. In the long-continued application (24 hr.) Marshall silt loam showed a fairly constant rate of intake following the initial period. There was a gradual decline in rate, however, giving the curve a slight downward trend. The curves . . . show a rapid intake during the initial period and a slight downward trend toward the close of the period. . . . The long-continued application with its slightly downward trend shows a reduction in infiltration rate which results from a high soil-moisture content. In the present work with Marshall silt loam the reduction apparently became

appreciable at or slightly above a moisture content of 30 percent on a dry-weight basis.

"In this study little evidence is found that close vegetation, such as bluegrass and alfalfa, increases the rate of infiltration enough to account for the marked control of surface run-off that is characteristic of such cover. The rate, however, is sustained over a longer period of time. . . . The reduction in run-off . . . may be accounted for at least in part by a lower velocity of run-off, which gives in effect a greater time for infiltration. The effect of lower velocity becomes particularly marked when studied for areas of appreciable size. . . .

"The study as a whole would indicate that, although the infiltration rate may be greatly modified by changes in porosity induced by one or another means, and relatively by soil moisture content or vegetative cover, yet the dominant factor may well be the soil type, at least insofar as comparison between the permeable Marshall and the relatively impermeable Shelby are concerned. The transitory effects of cultivation and low soil-moisture contents doubtless account to a large degree for variations in run-off which are commonly found for similar rains. They cannot be relied upon, however, in the design of erosion control measures, for which purpose infiltration rates of a conservatively low magnitude should be used."

The comparative moisture-absorbing and moisture-retaining capacities of peat and soil mixtures, I. C. Feustel and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 532 (1936), pp. 26, figs. 12*).—From this investigation the following conclusions are drawn:

"The maximum moisture-holding capacity of peat is more than twice that of soil, compared on a basis of equal volumes of material. Mixtures of peat with soil in equal proportions by volume absorbed from 40 to 50 percent more moisture than the untreated soil in the case of a clay loam and as much as 80 percent more in the case of pure quartz sand. Values for a loamy fine sand soil were intermediate. Evaporation rates from initially saturated soils and peat mixtures were similar during the first part of the evaporation period, but later the presence of peat resulted in a definite increase in the evaporation rate. Fibrous-moss peat lost moisture at a greater rate than the more decomposed and granular reed peat. This was characteristic also of the respective mixtures with soil. When the materials had a lower but identical initial moisture content, peat caused a reduction in the evaporation rate of soil, except in the case of moss peat with clay loam soil. Reed peat reduced evaporation to the greatest extent, whereas sedge peat was intermediate in its effects. Mixtures of peat with sand retained more moisture relative to the sand alone than did the corresponding clay loam soil mixtures.

"Observations in connection with field plats and greenhouse pots indicated little or no advantage in the use of any variety of peat with clay loam soil with regard to the supply of moisture available to plants during a dry period, with the possible exception of decomposed reed peat. Beneficial effects in moisture economy, however, were obtained on quartz sand and to a less degree on loamy fine sand soil. Reed peat was more effective than moss peat.

"Wilting-point determinations, using dwarf sunflowers (*Helianthus annuus nanus*) as indicator plants, showed that a decomposed type of peat had a considerably greater content of unavailable moisture than fibrous varieties. Moss peat had a content only slightly greater than clay loam soil. Addition of peat to soil increased the wilting moisture content by an amount proportional to the quantity of peat used and to the magnitude of unavailable moisture, as compared with that of the soil before mixing. Wilting percentages of peat and of mixtures of peat with soil were found to be in general qualitative

agreement with values calculated from the moisture equivalent by the Briggs and Shantz formula.

"The use of peat as a soil amendment for the sole purpose of conserving a supply of available moisture is not recommended, except, possibly, in the case of a decomposed type of peat with a sand or a very sandy soil. The textural and other physical or chemical effects have not been considered in this study. These must be evaluated, however, in judging the benefit which may be realized from the addition of peat to soil."

Automatically operated sand-culture equipment, F. M. EATON (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 6, pp. 433–444, figs. 3*).—The improved automatically operated sand-culture equipment described in this contribution from the U. S. D. A. Bureau of Plant Industry is designed to provide (1) the advantages of large-vessel, or flowing-type, water cultures with regard to the maintenance of solution concentration and (2) the numerous advantages of sand cultures, such as aeration, iron supply, seedling germination, root environment, and elimination of plant supports. The solution is applied by motor pumps controlled by a time clock to the surface of free-draining sand cultures at hourly or other selected intervals. The displaced solution returns by gravity to the supply reservoir.

Equipment in use at the Rubidoux Laboratory, Riverside, Calif., is described, and suggestions on the construction of sand beds and solution reservoirs (with constructional detail shown in part in dimensioned drawings), on types of sand, on iron supply from water-insoluble minerals, on control of troublesome organisms in the sand, and on the applicability of the method to hothouse culture are offered. Suitable culture solutions, including one devised and found of practical value at the Rubidoux Laboratory, are briefly discussed.

A study in soil nitrogen, F. W. MORSE (*Massachusetts Sta. Bul. 333* (*1936*), *pp. 20*).—In part, the results of 12 yr. of an investigation in which the continuous production of nonlegume crops was compared with the alternation of a legume with a nonlegume crop, and the continuous absence of nitrogen fertilizers was compared with the alternation of applied nitrogen with residual nitrogen, are recorded as follows:

"Nitrogen applied to legume crops produced no practical gain with clovers, about 7 percent increase with soybeans, and between 8 and 9 percent increase with mixed oats and peas. Nitrogen applied to six nonlegume crops increased their total product 41 percent. Residual nitrogen and absence of nitrogen produced virtually equal yields on the legume subplats. Residual nitrogen produced 10 percent more dry matter on the nonlegume subplats. On plats which received nitrogen it was applied in 7 yr. out of 12, to the total amount of 315 lb. per acre. On these plats, alternation of legume crops with nonlegume crops produced in 11 harvests a total of 41,580 lb. per acre of dry matter containing 750.1 lb. of nitrogen; continuous nonlegume crops produced 46,640 lb. of dry matter and 493.6 lb. of nitrogen. The nonlegume subplats produced 12 percent more dry matter, but 34 percent less nitrogen than was produced by the legume subplats.

"On the plats which did not receive nitrogen fertilizers, alternation of legume crops with nonlegume crops produced 40,120 lb. per acre of dry matter containing 741.7 lb. of nitrogen; continuous nonlegume crops produced 35,590 lb. of dry matter and 356.9 lb. of nitrogen. The nonlegume subplats produced 11 percent less dry matter which contained 52 percent less nitrogen than was produced by the legume subplats. Application of nitrogen to the legume crops appeared to be practically needless. The nonlegume crops recovered only 43.3 percent of the nitrogen supplied to them. . . .

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"Analyses of the soils showed no evidence of accumulation of nitrogen by the application of nitrogen fertilizers or by the growth of legume crops. Continuous production of nonlegume crops did not measurably deplete the soil nitrogen. Ratios of nitrogen to organic matter were slightly narrower when legume crops occupied the plats without nitrogen fertilizers." From records and analytical data it is estimated that two plats had produced from 1884 to 1889 six crops of corn without nitrogen fertilizer, and that these crops had contained a total of 20,520 lb. per acre of dry matter and 241.4 lb. per acre of nitrogen. From the nonlegume subplats of these same plats, between 1925 and 1934 inclusive, six crops of summer nonlegumes were produced, including two crops of sweet corn, two crops of Japanese millet, and two crops of Hungarian millet. Weighed, sampled, and analyzed, these crops contained 23,790 lb. per acre of dry matter and 239.3 lb. of nitrogen. During the 40 intervening years the plats had not received nitrogen fertilizers, and legumes had been eliminated from the nonlegume subplats. The soil appeared capable of supplying to nonlegume crops growing during the summer months an average of 40 lb. per acre of nitrogen, with no measurable depletion."

The influence of the decomposition of organic matter on the oxidation-reduction potential of soils, W. Burrows and T. C. Cordon (*Soil Sci., 42 (1936), No. 1, pp. 1–10, figs. 5*).—The authors here report upon an investigation at the New Jersey Experiment Stations, discussing briefly the technic employed in the potential measurements and recording the potentials developed in soils to which they had added casein, alanine, dextrose, starch, stable manure, rye straw, freshly cut grass, and rye straw with diammonium phosphate. They studied also the effect of moisture (18, 24, 30, and 36 percent) on the potential produced in standing soil and the potentials developed in sand media with carbohydrate and with protein bases during the growth in each of these media of two *Actinomyces* species, of one *Trichoderma* and one *Mucor* species, and of *Bacterium fluorescens* and *B. cereus*.

With respect to the technic of oxidation-reduction potential measurement in soils, the authors found it possible to avoid the difficulty of drifting potential readings, pointed out by Peech and Batjer (E. S. R., 73, p. 752), by substituting a saturated potassium chloride solution bridge for the agar bridge. The agar bridge could not be sufficiently thoroughly cleaned, "but when saturated KCl solution bridges were used and flushed with considerable quantities of fresh solution, in addition to careful cleaning on the outside, between samples, this difficulty was not experienced, and a series of samples, varying considerably in their potentials, could be read in any order without affecting the final result." Bright platinum plate electrodes made rigid by means of a sealed-on glass support were not satisfactory, but duplicate electrodes of bright platinum wire inserted into the soil were adequate for the purpose.

It is further noted that "the practice of suspending soil in water or dilute acid solutions prior to measuring oxidation-reduction potential is open to some criticism. It is quite possible that dissolved oxygen in such liquids will affect relatively poorly poised systems to a considerable degree. In the experiments under consideration here wide and unpredictable fluctuations have been observed, not only in comparing values obtained from direct measurements on soil with those obtained on water suspensions of the same soil (prepared for pH determinations), but also among duplicate samples of soil subjected to such treatment. We have, therefore, endeavored to make potential measurements on soil samples disturbed as little as possible. In this way, fairly good agreement between duplicate pots has been obtained."

Of the data obtained the authors state that "the experimental evidence . . . indicates that the type of decomposable organic matter present in the soil is a highly important factor in the determination of the degree of reducing intensity that will prevail. Decomposition of casein was found to result in strongly positive potential levels, whereas decomposition of carbohydrate produced more negative, but not extremely negative, potentials which do not appear to differ greatly from those produced in standing soil to which no organic matter was added. The effect of moisture content on potentials developed in standing soils was found to be negligible."

A green manure fertilizer study on Norfolk sand, J. E. Adams, E. M. Roller, and H. M. Boggs (*Soil Sci., 42 (1936), No. 3, pp. 175–185, pl. 1, figs. 4*).—The U. S. D. A. Bureau of Plant Industry reports upon an investigation in which the fertilizer value of legume stubble was compared with that of full crops of legumes turned under in a rotation with corn and cotton. In these trials, which were carried out on Norfolk sand with the cooperation of the South Carolina Experiment Station, "crops grown on stubble plats were fertilized with materials forming a 6–8–4 ratio; those grown where legumes were turned received a 2–8–4 fertilizer."

It is stated that "a 6–8–4 fertilizer applied to crops grown where the stubble of soybeans, velvetbeans, and cowpeas had been turned produced larger yields than where the 2–8–4 fertilizer supplemented the green manures, all plats being left fallow during the winter. Rye and vetch used as a winter cover following cowpea stubble, and also where cowpeas were turned as green manure, produced greater yields than on plats allowed to lie fallow during the winter. The higher nitrogen fertilizer-cowpea stubble-winter cover combination produced the largest yields. The use of the stubble and 6–8–4 combination results in a greater conservation of carbon and nitrogen than the green manure and 2–8–4 combination. The two systems are practically of equal efficiency in the case where a winter cover follows both cowpea stubble and cowpeas turned as a green manure. Yields of corn and cotton were but loosely associated with the total carbon content of the soil at the end of the second round of the rotation. This correlation was less apparent when increased quantities of nitrogen were applied in the form of commercial fertilizers.

"There has been a considerable reduction in the carbon: nitrogen ratio of the soil. This is thought to be associated with an increase in the availability of the nitrogen present. Yields were influenced more by the nitrogen of the fertilizer than by the management of the legumes. The winter cover was apparently more effective in influencing yields than was the legume green manure or legume stubble."

Effects of summer cover crops on crop yields and on the soil.—II, Influence of summer cover on nitrate and organic matter content of a poor grade of Norfolk soil, R. M. Barnette and J. B. Hester (*Florida Sta. Bul. 301 (1936), pp. 14–22, figs. 3*).—Part 1 of this bulletin has been noted on page 323.

Nitrate determinations were made at three depths at intervals of 2 weeks from February to October, during 1927 and 1928. "The accumulation of nitrates . . . was found to depend primarily upon the amounts and distribution of rainfall. Samples taken following periods of excessive and leaching rainfall showed only traces of nitrates in all soil depths. Samples collected during drought periods showed higher concentrations of nitrates in all soil depths. On most dates of sampling, the 0–9 in. depth had a higher nitrate content than the 9–21 in. depth, which in turn had a higher content than the 21–33 in. depth. Following periods with a number of light rains just previous

to sampling or dry periods with one heavy rain, some of the nitrates of the upper soil depths were leached in the lower depths.

"*From the first of February to the middle of June there was a definite effect* of the different summer cover crops plowed into the soil on the nitrate content of the soil. During this period the soil into which the planted leguminous summer cover crops had been turned showed a higher nitrate content than the soil in which 'Florida pusley' had been incorporated. *Crotalaria striata* plowed into the soil gave the highest nitrate content in the soil for this period, both in 1927 and in 1928. The nitrates formed from the decomposition of velvetbeans and cowpeas were about the same in 1927, but cowpeas gave a higher nitrate content in the soil in 1928 than did velvetbeans. The decomposition of beggarweed gave rise to a lower nitrate content in the soil than did the other planted leguminous cover crops. After the middle of June there was apparently no specific effect on the accumulation of nitrates in the surface soil attributable to the plowing under of the different summer cover crops. The early fall period of both years is marked by a low nitrate level in the soil. . . .

"The different summer cover crops plowed into the soil had no specific effect on the content of well-decomposed organic matter, carbon, and nitrogen in the soil. The average C:N ratio of the soil was found to be 13.6 for the 0–6 in. depth and 14.1 for the 6–12 in. depth."

The base exchange capacity of decomposing organic matter, H. C. Millar, F. B. Smith, and P. E. Brown (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 753–766, figs. 7*).—The authors of this contribution from the Iowa Experiment Station determined the base-exchange capacity and the nitrogen, carbon, and lignin contents of oat straw, wheat straw, Sudan grass, cane sorghum, flax, cornstalks, millet, hemp, soybeans, alfalfa, sweetclover, and red clover in the mature plant materials before composting and in the residual material after 210 days of decomposition.

"*Mature plant materials differ greatly in the base-exchange capacity.* The base-exchange capacity of 12 plant materials was significantly correlated with their lignin contents, and highly significantly correlated with their nitrogen contents. No correlation was found between the base-exchange capacities and either the carbon contents, acid-hydrolyzable fractions, or the alcohol-benzene soluble materials of the plants. As the plant materials decomposed they increased in base-exchange capacity many times more than they decreased in weight or in lignin content. The base-exchange capacity of the materials was not found to be in the same relation to one another as they decomposed.

"The lignin content of the plant materials disappeared at the rate of from 24.71 percent in 210 days with one sample of cane sorghum to 54.8 percent in 210 days with one sample of soybeans."

Reclamation of white-alkali soils in the Imperial Valley, E. E. Thomas (*California Sta. Bul. 601 (1936), pp. 15, figs. 4*).—Reclamation experiments have demonstrated that white alkali, such as that found in the Imperial Valley, where the deep subsoils contain relatively large amounts of soluble salts consisting mainly of the chlorides and sulfates of sodium, calcium, and magnesium, and a high water table has caused the accumulation of alkali near the surface of the soil, can be leached out provided the drainage conditions are favorable. "No special treatment with materials such as gypsum and sulfur is needed. The untreated leached plats of the experiments gave as good results as those that were treated and leached. The water table must be kept well below the root zone if good results are to be expected. For this reason good drainage conditions are essential.

"After the salts have been leached out, a good seedbed should be prepared before seeding to any crop, and at planting time the soil moisture should be sufficient to insure germination without the necessity of irrigation. The young alfalfa should be irrigated frequently to prevent excessive drying out and to promote the downward movement of water. The soluble salts will thus gradually be leached deeper and deeper into the subsoil and ultimately out into the drainage system."

Reclamation of black-alkali soils with various kinds of sulfur, E. E. Thomas (*Hilgardia [California Sta.], 10 (1936), No. 5, pp. 127–142, figs. 6*).—The preparations used were (1) sulfur inoculated with the oxidizing bacterium *Thiobacillus thiooxidans*, (2) uninoculated, finely ground elemental sulfur, (3) uninoculated coarse sulfur, (4) uninoculated colloidal sulfur, and (5) uninoculated sulfur concentrate.

"All of the sulfurs used gave good results both in the laboratory and in the field, but the rates of oxidation were different. The rate of oxidation of sulfur inoculated with *T. thiooxidans* was greater than that of the uninoculated sulfurs for the first 8 weeks of the experiment. Uninoculated sulfurs with particles similar in size to those of the inoculated sulfur underwent fully as rapid oxidation after the lapse of 8 to 10 weeks as the inoculated sulfur. The rate of oxidation of the coarse sulfur was slower than that of any of the finer-grained sulfurs because of the difference in particle size. In the course of time, however, the coarse sulfur gave as good results as the other sulfurs. This was shown by the fact that 18 mo. after the coarse sulfur had been applied, the CO_3 content of the soil was reduced in each foot layer to a depth of 4 ft."

With regard to practical field treatment it was found that "the soil should be leveled before application is made. When applied, the sulfur should be mixed with the soil by shallow plowing or disking, after which irrigation and cultivation should be as frequent as is necessary to keep the soil moist and well aerated. Good drainage conditions are necessary in order that the soluble salts may be removed from the soil by leaching. In some cases it may be possible to leach the soluble salts from the root zone by the regular irrigations, while in other places it is necessary to subject the soil to heavy flooding in order to remove the salts."

Artificial manure production on the farm, W. A. Albrecht (*Missouri Sta. Bul. 369 (1936), pp. 12, figs. 5*).—Such materials as straws, cornstalks, cotton hulls, and other organic residues were composted easily by adding 67.5 lb. of ammonium sulfate, 60 lb. of fine limestone, and 22.5 lb. of superphosphate per ton of dry matter. It was found practicable to add the mineral nutrient mixture "while the straw, for example, is coming from the thresher. When piled to a height of 6 ft. with flat top so as to take the rain, the decay will proceed as the moisture allows. Such composting may also be done by hand, but it is less laborious when the chemicals are applied through the machine as the thresher, which mixes them more effectively. "Farm trials of the resulting manure warrant wide consideration of this process as a help in getting more organic matter into the soil."

[Availability of phosphates] (*Georgia Sta. Rpt. 1936, pp. 11, 12, 25, 26*).—Tests in cooperation with the Tennessee Valley Authority are briefly noted.

Soil liming investigations.—II, The influence of lime on the sorption and distribution of phosphorus in aqueous and soil colloidal systems, J. A. Naftel (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 740–752, figs. 4*).—Continuing a series of papers already noted (E. S. R., 76, p. 164), the author reports upon his determinations of the titration curves of phosphoric acid in aqueous and soil colloidal systems with the calcium and magnesium ions.

"The formation of calcium phosphates in aqueous solutions was as follows: Monobasic pH 3.0 to 5.0, dibasic pH 5.0 to 6.4, and tribasic above pH 6.4. The formation of $CaHPO_4$ is transitory, and during the transition the H-ion concentration of the solution increases. The presence of an excess of Ca in alkaline medium forms a more basic salt than the tribasic phosphate. This salt is probably hydroxyapatite, $3Ca_3(PO_4)_2 \cdot Ca(OH)_2$. The distribution of magnesium phosphates was quite similar to that of calcium except for the greater solubility of the former. The distribution of phosphates in the presence of $Ca \cdot Mg(HCO_3)_4$ was different from that of either Ca or Mg alone. The solubility of the phosphates over the complete range was greater where Ca and Mg were present than where Mg was added alone."

It was also found that "Ca had practically no effect on the sorption of phosphates by colloids of low SiO_2/R_2O_3, but with those of high ratio the phosphates sorbed were greatly increased. In all cases where atmospheric CO_2 was present the excess P was precipitated, but where the system was saturated with CO_2 the latter was in solution. Results obtained during this investigation indicate that liming acid soils causes a decrease in available P by increasing the sorption by the soil colloids only on soils of high SiO_2/R_2O_3. This effect reaches a maximum below the Ca saturation point. Previous apparently conflicting data on the influence of lime on phosphate solubility appear to be compatible when interpreted in the light of the present investigation."

The value of lime in a two-year rotation on Sand Mountain.—A progress report (*Alabama Sta. Circ. 75 (1936), pp. 11, figs. 3*).—The most profitable 2-yr. addition of lime with proper fertilizers was the 400-lb. per acre rate added in the drill. The 2,000-lb. per acre rate applied once each 10 yr. was the most profitable broadcast application. "Lime increased the yields of all crops in the rotation regardless of the kind of fertilizers used, but was most practical where the cotton received the proper complete fertilizer and the corn received the residue from the superphosphate and muriate. . . . The most important and practical use of lime was obtained when legumes were grown in the rotation of cotton and corn receiving proper fertilizers."

Methods of calculating fertilizer mixtures, J. F. Lutz (*North Carolina Sta. Agron. Inform. Circ. 99 (1936), pp. [1]+8*).—This is a revision of a circular already noted (E. S. R., 66, p. 617).

Commercial fertilizers, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 409 (1936), pp. 28*).—This annual report (E. S. R., 74, p. 15) covers the limes and limestones sold in 1936 as well as the fertilizers. Data concerning the acid-forming effects of the fertilizers were also obtained. These data showed that 883 tons of limestone would be required to neutralize the acidity developed by the 10,252 tons of complete fertilizer sold.

The use of soil tests is discussed.

AGRICULTURAL BOTANY

Handbook of native woody plants of the United States, W. R. Van Dersal (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-TP-11, pp. [3]+287, pl. 1*).—This handbook was prepared to assist those engaged in erosion control work who are being called upon to prepare lists of woody stock for prospective planting in various localities.

The introduction gives a general discussion of woody plant requirements for erosion control, selection of species, and planting species for wildlife and erosion control. The alphabetical list, which takes up the greater part of the work, includes the range, site, habit, and type of fruit for each species, often with additional notes.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, April 1 to June 30, 1934 (*U. S. Dept. Agr., Inventory 119* (*1936*), *pp. 38*).—This number lists 897 lots of plant material introduced for testing in the United States. In many cases descriptive notes are included.

Principal decisions concerning nomenclature made by the Sixth International Botanical Congress, T. A. SPRAGUE (*Roy. Bot. Gard., Kew, Bul. Misc. Inform., No. 2* (*1936*), *pp. 185–188*).

An inexpensive recording porometer, B. D. BOLAS and I. W. SELMAN (*Ann. Bot.* [*London*], *49* (*1935*), *No. 196, pp. 803–807, figs. 6*).—An improvement in the water reservoir used with Knight's porometer (E. S. R., 49, p. 521) is presented, and a description is given of a simple, inexpensive bubble-recording apparatus in which records over a period of 24 hr. are obtained by perforation of a paper chart by means of sparks from an induction coil.

A simple quartz mercury arc, A. J. ALLEN (*Science, 83* (*1936*), *No. 2153, p. 336, fig. 1*).—The arc described has found many laboratory applications, including dark field photomicrography, studies of the effects of visible and ultraviolet monochromatic radiations on micro-organisms, and cinema filming of micro-organisms.

Transpiration and pressure deficit, III, IV, F. M. HAINES (*Ann. Bot.* [*London*], *50* (*1936*), *Nos. 197, pp. 1–22, figs. 5; 198, pp. 283–291, figs. 2*).—A continuation of this series (E. S. R., 74, p. 19).

III. *Observations by the thermopile method.*—Measurements of the transpiration rates from leaves of *Acer pseudoplatanus* enclosed under pressure were made by a thermopile method involving a comparison of the temperatures of a transpiring and a vaselined leaf under the same conditions.

The results indicated that when an increased "pressure deficit" (difference between the pressure in conducting tracts and at leaf surfaces) is applied in this way transpiration is reduced, the reduction being relatively greater for the smaller deficits. A decrease in the deficit caused a very large and immediate increase in transpiration rate. The rate-deficit curve is definitely concave toward the origin, implying that deficits cannot reduce transpiration by their effects on the vapor pressure at the leaf cell surfaces alone but must also cause an increase in the resistance to water flow through the leaf cell protoplasts. Previous results in this series are therefore confirmed.

IV. *The effect of small deficits: Apparatus and preliminary experiments.*—"An apparatus is described for the investigation of the special effects of small pressure deficits on the transpiration and absorption rates of cut woody branches. Preliminary experiments show that the first effect of a small deficit is to cause an increase in traspiration rate which is later followed by a decrease. Reduction or elimination of a small deficit during the initial period of increased transpiration causes at first a slight decrease in transpiration rate."

A simplified procedure for microprojection and photomicrography: Its application to the study of modifications in cellular structure by ultraviolet rays [trans. title], E. GILLES (*Bul. Mens. Soc. Linn. Lyon, 4* (*1935*), *No. 7, pp. 105–109*).—The apparatus described is said to allow several persons to observe microscopic preparations at the same time and to follow (and permit the photographing of) the development of cellular structures such, e. g., as in *Spirogyra*.

A universal culture apparatus [trans. title], F. FUHRMANN (*Zentbl. Bakt.* [*etc.*], *2. Abt., 92* (*1935*), *No. 8–12, pp. 257–260, figs. 3*).—A culture apparatus with many applications is described, which provides for a continually available

intake of small amounts of sterile culture fluid and for the obtaining for analysis of the metabolic gases set free by the micro-organisms cultured.

The present status of the proposal to change the composition of the agar and temperature of incubation of the standard agar plate technic of the American Public Health Association, R. S. BREED (*Jour. Dairy Sci., 19 (1936), No. 7, pp. 493, 494*).—This is an abstract of a contribution by the New York State Experiment Station.

Hydrogen sulfide production as a differential test in the colon group, R. VAUGHN and M. LEVINE (*Jour. Bact., 32 (1936), No. 1, pp. 65–73*).—This is a contribution by the Iowa State College.

Physiological and cytological researches on some species of the genus Pythium [trans. title], R. K. SAKSENA (*Rev. Gén. Bot., 48 (1936), Nos. 567, pp. 156–188, pls. 7, figs. 4; 568, pp. 215–252, figs. 3; 569, pp. 273–313*).—The author first describes the general plan of the investigation, including the fixatives and fixation procedures, stains and staining technic, and culture media used in studying the growth conditions, cytology, and life history of *P. deliense*, *P. debaryanum*, *P. mamillatum*, and *P. indigoferae*, the results of which are reported in detail. These studies included their behavior in various media and under various conditions, the effects of environment (temperature, pH, light v. darkness, various nutrients, and oxygen deficiency) on sexual reproduction, the hydrolytic activities of the four species, and the morphology, cytology, and life history, including the sporangia, sexual organs, resting nuclei, Golgi apparatus, chondriomes, vacuolar system, etc. A final section discusses the systematic position of several species of the genus as elucidated by the cytologic findings and the literature, and as a result of these comparisons the five species considered from this standpoint are placed in the following ascending order of evolution: *P. aphanidermatum*, *P. deliense*, *P. torulosum*, *P. debaryanum*, and *P. ultimum*. A seven-page literature list is included.

Physiological studies on Rhizobium.—V, The extent of oxidation of carbonaceous materials, O. R. NEAL and R. H. WALKER (*Jour. Bact., 32 (1936), No. 2, pp. 183–194, figs. 7*).—Continuing these studies at the Iowa Experiment Station (E. S. R., 74, p. 214), *R. meliloti* and *R. japonicum* were cultured in media containing comparatively small amounts of various carbonaceous substances. Measured at regular intervals for 24 hr., the rate of oxygen consumption increased consistently until about one-third of the theoretical amount required for complete oxidation of the carbohydrate was consumed. At that stage of dissimilation there was an abrupt decrease in the rate of oxygen consumption and in the respiratory quotient, interpreted as a change from carbohydrate metabolism to a protein or fat metabolism. Though the character of the dissimilation process and the intermediate and end products were not investigated, it appeared possible that a large part of the carbohydrate not accounted for by the oxygen consumption was used in the formation of new cell substance.

R. japonicum, usually regarded as a slow grower, consumed oxygen (or grew) much more rapidly on a substrate containing arabinose than on one containing glucose, and its growth rate on this medium compared favorably with that of *R. meliloti* on substrates containing glucose or mannitol.

The synthesis of C-vitaminlike substances by fungi and bacteria, I [trans. title], K. BERNHAUER, B. GÖRLICH, and E. KÖCHER (*Biochem. Ztschr., 286 (1936), No. 1–2, pp. 60–65*).—The substance referred to was formed by the action of *Aspergillus niger* on cane sugar solutions. Reference is made to a similar substance reported in the literature as due to the symbiotic action of yeasts and acetic acid bacteria.

The origin of new types of imperfect fungi from interspecific co-cultures, H. N. Hansen and R. E. Smith (*Zentbl. Bakt.* [*etc.*], *2 Abt.*, *92* (*1935*), *No. 8–12, pp. 272–279, figs. 6*).—In this study by the University of California, two of the most stable and well characterized species of *Botrytis* (*B. allii* and *B. ricini*) were grown together in cocultures and their progenies analyzed by single-spore methods in many culture series. By repeated single sporing and selection from the aberrant cultures obtained, three types were segregated which appeared sufficiently distinct to be considered new varieties or even new species. These types remained constant through five single-spore culture series, while the contemporaneous series of cultures from the original parents did not vary.

It is suggested that the production of these aberrant homotypes may be due to gene changes induced in some way by interspecific anastomosis.

Plant tissue cultures from a hormone point of view, J. Bonner (*Natl. Acad. Sci. Proc.*, *22* (*1936*), *No. 6, pp. 426–430*).—Tests are described in which parenchymous tissues from the cavity lining of young bean pods were made to undergo both cell division and cell enlargement in the dark in the presence of growth-promoting material obtained from plant tissue extracts, particularly from green parts. Similar effects were unobtainable with pantothenic acid. The growth factor involved was found unlike vitamins B_1 and B_2 or the auxins in chemical properties. The cultures are thought by the author to represent closer approach to true plant tissue cultures than other attempts thus far reported.

Atomic dynamics of plant growth, G. Hevesy, K. Linderstrøm-Lang, and C. Olsen (*Nature* [*London*], *137* (*1936*), *No. 3454, pp. 66, 67, fig. 1*).—Using the method of isotopic (radioactive) indicators, the authors' experiments with maize are believed to show clearly that the phosphorus atoms of the leaves are present in a mobile state, and that during growth a continuous interchange of phosphorus atoms takes place between the different leaves. The data also indicate three intermediate stages in the phosphorus uptake of the plant and an increase in the ratio of "radioactive" to total phosphorus with time.

The fact that the easy exchangeability already found for lead (present only incidentally in plant tissues) is now determined for phosphorus (one of the chief plant constituents) is believed to indicate that the authors were dealing with a general property of plant constitution.

On the influence of ultra-violet rays upon the frequency of nuclear division in plants, N. Takamine (*Cytologia*, *6* (*1935*), *No. 4, pp. 444–456, figs. 6*).—When root tips of *Vicia faba* were exposed to ultraviolet rays from a quartz mercury lamp the number of nuclear divisions was greater on the side of the ray source during the first few hours, progressively increased to a maximum, after which (at from 2 to 3 hr.) the number began to decrease and finally fell below the normal frequency. A tendency to recover the normal frequency became recognizable after from 1 to 2 days if the material had not been exposed too long. When the material was exposed to wavelengths of from 2,535 to 2,537 a. u. no increase in the number of nuclear divisions occurred, but rather a decrease, although a tendency to recover was recognizable after a time. On exposure to 3,655 a. u. for 3 hr. the frequency of division was above normal for a time and then fell below. This was in marked contrast to the effects of from 2,535 to 2,537 a. u., where the frequency of division was below normal from the moment of exposure.

The influence of light on the reactability of plants to growth substance [trans. title], F. Laibach (*Jahrb. Wiss. Bot.*, *83* (*1936*), *No. 2, pp. 324–339, figs. 5*).—By darkening certain plant organs basipetal growth was promoted

therein. This growth promotion is said to depend on raising the reactability to growth substance, which is conditioned by a substance produced by the plant in the dark but not in the light.

Skatole as a growth-promoting substance, J. Glover (*Nature* [*London*], *137* (*1936*), *No. 3460, pp. 320, 321*).—Experiments with oat coleoptiles suggested that skatole may act in the plant as a growth-promoting substance. Both skatole and β-indole-acetic acid were observed to be markedly light-sensitive.

Absorption and movement of synthetic growth substances from soil as indicated by the responses of aerial parts, A. E. Hitchcock and P. W. Zimmerman (*Contrib. Boyce Thompson Inst.*, *7* (*1935*), *No. 4, pp. 447–476, figs. 4*).—Applications of heteroauxin or of indolepropionic, indolebutyric, naphthaleneacetic, phenylacetic, or phenylpropionic acids to the soil induced responses in tomato and tobacco similar to those described as following applications in lanolin, water, or oil to the aerial plant parts (E. S. R., 73, p. 758). Bending, proliferation, and rooting responses on stems and leaves and the inhibition of lateral bud growth were used to detect the growth substances at a distance from the region of application and to determine the relative rates of absorption from the soil and the movement through the aerial parts.

With minimum active amounts of growth substance, absorption from the soil was delayed or prevented under conditions greatly reducing water loss from the plant, but with larger amounts absorption was only delayed. Absorption occurred through both intact and injured roots. Responses induced by lanolin preparations applied to aerial parts were not influenced by atmospheric conditions in the same manner as the responses from soil treatment. Since the type and degree of formative response depended on the application method, it was concluded that the true sensitivity of an organ or tissue to the growth substance cannot be determined until the factors affecting penetration and transport of the substance from the application to the response region have been properly accounted for.

Under optimum conditions the upward rate of movement of these substances in tomatoes was over 47 cm per hour, and living cells were not essential for their transport. Movement upward was faster than downward, and in both cases faster through intact than through dead tissue. There was no appreciable longitudinal movement through the bark of tobacco stems. A strictly polar movement of the growth substances was not observed in stems or leaves of tobacco or tomato. It is believed that when applied as aqueous solutions these growth substances move longitudinally in the xylem. Success in inducing responses at distant points with active aqueous preparations appeared to depend on whether penetration to the transpiration stream had been effected. With respect to this lack of polar transport and ease of movement throughout the plant, the crystalline growth substances resemble ethylene gas.

Bending of the stems was the most sensitive response to the growth substances. Bending toward light took place sooner with a distinct one-sided illumination, but light is not essential to stem bending, since it occurred also in darkness. This response to light has not been reported previously. By applying growth substances to the soil, flowering of Turkish tobacco was accelerated by from 3 to 5 weeks. A retarded growth was not associated with this premature flowering, and optimum amounts for flowering were much less than for rooting. This influence of these growth substances on flowering has not been reported before, but the results confirm to a certain extent the published work with sex hormones on various plants.

The significance of these studies in relation to absorption and transport of materials in general and to certain practical applications in the rooting of cuttings is discussed.

The elimination of mineral substances by plant roots [trans. title], A. I. ACHROMEIKO (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 42 (1936), No. 3-4, pp. 156-186, figs. 2*).—As a result of this study, the author places all plants in one or the other of two groups on the basis of the elimination of mineral substances by the roots. To the first group belong plants (e. g., Gramineae and root, tuber, and vegetable crops), the roots of which under normal growth conditions do not eliminate phosphoric acid or other mineral substances. In the second group (e. g., legumes and oleiferous plants) the elimination of these substances occurs as a normal physiological function. Plants of the first group are characterized by an accumulation of carbohydrates and an approximately neutral reaction of the sap, and those of the second by that of proteins and fats and an acid sap. The physiochemical and physiological ramifications and significance of the findings and their application to fertilizer practice are discussed.

Excretion of amino acids from the root nodules of leguminous plants, A. I. VIRTANEN, T. LAINE, and S. v[ON] HAUSEN (*Nature [London], 137 (1936), No. 3459, p. 277*).—Evidence is presented confirming the idea that amino acids are excreted from the root nodules, and not at all or in negligible amounts from the roots.

Carbonic anhydrase and photosynthesis, G. O. BURR (*Roy. Soc. [London], Proc., Ser. B, 120 (1936), No. 816, pp. 42-47*).—The observed rate of photosynthesis by green plants was found to be far greater than the rate of uncatalyzed hydration of CO_2. The constants for the latter reaction are taken from extensive published work done in studies on carbonic anhydrase in animal tissues.

Preliminary experiments with ground leaf tissues have failed to demonstrate the presence of a catalyst for CO_2 hydration, and these findiugs throw doubt on the view that CO_2 must become hydrated to H_2CO_3 before reacting with chlorophyll.

Determination of the chloroplast pigments of plants, A. E. MURNEEK (*Science, 83 (1936), No. 2153, p. 327*).—This contribution by the University of Missouri calls attention to important details in technic.

Tissue cultures of spermatophytes, C. D. LARUE (*Natl. Acad. Sci. Proc., 22 (1936), No. 4, pp. 201-209*).—Pieces no more than 0.5 mm in length, cut from immature embryos of dandelion, wild lettuce, oxeye daisy, and tomato, were grown into complete plants in culture and shown to be capable of subsequent growth in soil. The technic, results, and significance of the study are discussed.

Further thermoelectrical investigations of the transpiration stream in trees [trans. title], B. HUBER and E. SCHMIDT (*Tharandter Forstl. Jahrb., 87 (1936), No. 5, pp. 369-412, figs. 28*).—The rates of the transpiration current in different deciduous trees, studied by the thermoelectric method here described, were shown to have three types of distribution in different parts of the tree, viz, the oak type (the rate decreasing toward the tips of the stem, branches, and twigs), the birch type (the reverse of the oak), and the type in which there is no significant or uniformly directed difference in rate in various parts of the tree. The majority of species tested belonged to the oak type. Ring-pored and diffuse-pored trees and day and night fluctuations in rate are compared, and the process in conifers is briefly discussed.

Relationships between stomatal opening, light intensity, and light wavelength [trans. title], H. HARMS (*Planta, Arch. Wiss. Bot., 25 (1936), No. 2, pp. 155-193, figs. 15*).—The stretching and the first part of the motor phases of stomatal opening were not dependent on light intensity. Only with the attainment of a definite degree of opening did the stomatal reaction become affected.

As to the effects of wavelength on the stomata of the lower leaf surface of *Helianthus annuus*, *Calla aethiopica*, *Pelargonium zonale*, and *Ricinus communis*, the blue, green, and orange-red lights were equally active, while the blue and green lights were equally active on *Vicia faba* and *Tradescantia albiflora* (orange red being less so). In all plants tested, red light evoked smaller stomatal openings than any other wavelengths. With respect to the stomata of the upper leaf surface of *Helianthus* and *Ricinus*, the green showed no more activity than the blue light, the orange-red less than the green, and the red light caused only limited opening or none. By from 4- to 14-day adaptation of the stomata to blue and red light it was possible to change the influence of red light on stomatal movement in relation to the blue. The stomata in white areas of variegated pelargonium must be irradiated by the green or orange light at 1.6 to twice the intensity of the blue light to attain a similar degree of opening.

Effects of nitrogen supply on rates of photosynthesis and respiration in plants, K. C. Hamner (*Bot. Gaz.*, *97* (*1936*), *No. 4*, *pp. 744–764*).—The purpose of this study was to determine the rates of photosynthesis and respiration of leaves attached to the plant, and of whole plants grown under different conditions of nitrogen nutrition, when such plants were subjected to various changes in the relative planes of nutrient supply. The test plants were tomato and wheat.

With respect to respiration, the same general results were obtained with both species, there being a marked increase in the rate following application of nitrate provided there was an initial carbohydrate reserve. The rate was roughly proportional to the amount of such carbohydrate content, and this was true for either leaves or roots. It was clear that a relatively high photosynthetic rate could be maintained by leaves low in soluble forms of nitrogen, relatively low in chlorophyll, and relatively high in carbohydrate content of the cells.

Roughly quantitative measurements of some of the compounds were made, and the apparatus described and used for determination of the CO_2 output and intake by the plants proved adequate, but detailed chemical analyses were not available for the experiments presented.

The influence of the tension of oxygen on the respiration of rhizobia, C. E. Georgi and P. W. Wilson (*Arch. Mikrobiol.*, *4* (*1933*), *No. 4*, *pp. 543–564*, *figs. 12*).—From cultures of *Rhizobium trifolii*, *R. leguminosarum*, *R. meliloti*, and *R. japonicum* grown in the Novy-Soule type of respiration apparatus at the University of Wisconsin, the respiratory quotient, the percentage of glucose consumed, and the carbon of the glucose used that appeared as CO_2 carbon were calculated. With the first three species the glucose used, the respiratory rate, and to some extent the glucose appearing as CO_2, increased with increasing oxygen potential. About 60 to 80 percent of the carbon in the glucose appeared in the CO_2 produced. All cultures had a respiratory quotient near unity, which was independent of the oxygen potential. The respiratory quotient of *R. leguminosarum* was inclined to be erratic. With *R. japonicum*, the respiratory rate, total oxygen consumed, and total CO_2 produced were much lower than for the other species. The glucose used increased with decreasing oxygen potential, and there appeared to be a small increase in the respiratory rate under the higher oxygen tensions.

With all the organisms, excellent fermentation of glucose with a high conversion into CO_2 was observed under low oxygen tensions (5 percent or less), provided the absolute quantity of this gas was present in excess of the requirements of the organisms.

Storage and germination of seeds of aquatic plants, W. C. Muenscher ([*New York*] *Cornell Sta. Bul. 652* (*1936*), *pp. 17*).—The results of germination tests on seeds of 43 species of aquatic plants after various treatments indicated that storage in water just above the freezing temperature is the best of the pro-

cedures tested for insuring viability and rapid germination in most of the species tested. Most of the species failed to germinate after from 2 to 5 mo. in water at room temperature. Except for *Vallisneria*, *Orontium*, and *Nasturtium*, seeds so treated entered a rest period but could be induced to germinate subsequently after chilling for 30 days. Most species failed to germinate after from 2 to 5 mo. in dry storage at from 1° to 3° C. or at room temperature.

GENETICS

The inheritance of screw tail in cattle, B. KNAPP, JR., M. W. EMMEL, and W. F. WARD (*Jour. Heredity, 27 (1936), No. 7, pp. 269–271, figs. 2*).—The kinky-tailed character due to the fusion of a pair of coccygeal vertebrae in Red Polled cattle as noted at the U. S. D. A. Bureau of Animal Industry station at Brooksville, Fla., is described. The character seemed to behave as a single Mendelian recessive.

Artificial production of the fabulous unicorn, W. F. DOVE (*Sci. Mo., 42 (1936), No. 5, pp. 431–436, figs. 4*).—Description is given of the transplantation of horn-forming tissue to other locations on the body and the production of unicorn cattle by transplantation of the horn bud on to the skull.

Studies of inheritance in lop-eared rabbits, W. E. CASTLE and S. C. REED (*Genetics, 21 (1936, No. 4, pp. 297–309)*.—In a study of the inheritance of the lop-eared character in rabbits, a male with ears measuring 24 cm at 120 days of age was mated with females of several breeds, such as Blue Beveren, New Zealand Red, and an English-Dutch race having ear lengths from 11 to 13.5 cm. In general, the ear length of the 65 F_1s born to 11 dams was related to the ear length of the dams, ranging from 11.5 to 19.5 cm. The F_2 and backcross progeny supported the multiple factor hypothesis for inheritance of ear length, which supposes a blending inheritance based on the action of numerous genes located in different chromosomes with independent segregation. The does with the shorter ear lengths were less homogeneous than those with the longer ears. Attention is called to the correlation between ear length, ear width, and body size.

Inheritance of umbilical hernia in rats, L. A. MOORE and P. J. SCHAIBLE (*Jour. Heredity, 27 (1936), No. 7, pp. 272–280, figs. 2*).—Among matings of albino rats at the Michigan Experiment Station, umbilical hernia appeared. In a study of the inheritance of the condition, there were produced 1,058 animals of which 414 had hernias of varying size. By selective inbreeding of herniated stock, the percentage of umbilical hernia was increased from 2.7 to 71.2. The mode of inheritance was evidently blended or due to multiple factors not sex-linked. Variations in the occurrence of herniated progeny are discussed, including a suggested relation of the condition to sex. Of 789 individuals produced by parents with herniated blood, 43.0±1.18 percent were males.

The occurrence of albino and spotted rats under feral conditions, A. SVIHLA (*Amer. Nat., 70 (1936), No. 729, pp. 403, 404*).—Attention is called to the prevalence of albino and spotted rats occurring and increasing on the island of Lanai under feral conditions. It is pointed out that the size of the island and linkage of the stocks promotes inbreeding, and that there is no natural elimination because of the unusual characters.

Shifts in expressivity in the heterozygote of a dominant lethal gene in the mouse, C. V. GREEN (*Jour. Expt. Zool., 73 (1936), No. 2, pp. 231–262, figs. 9*).—Study is reported on the number of caudal vertebrae in mice of the species *Mus musculus* carrying the *T* gene for brachyury in different crosses. The brachyuric strain of the Roscoe B. Jackson Memorial Laboratory, Bar Harbor,

Maine, is variable in the number of caudal vertebrae but averaged 8.28±0.36. When crossed with another strain of the same species, the brachyuric F_1 hybrids had an average of 16.00±0.39 caudal vertebrae. The number of caudal vertebrae was further increased in hybrids produced by mating brachyurics with the *bactrianus* species to 21.29±0.47. Little increase in the number of vertebrae of the brachyuric progeny was brought about in subsequent backcrosses. The variations in the expression of the *T* gene in different strains is considered due to the effect of dominant modifying genes. One such factor which modified the expression of the *T* gene toward the normal recessive condition was contributed by the normal *musculus* strain, whereas a larger number of modifiers were derived from the *bactrianus* strain. The difference in the average number of caudal vertebrae of 30.86±0.10 in *tt* mice of the *M. musculus* species and 25.30±0.07 for the *bactrianus* species is considered due to four genes.

An outcross of brachyuric and yellow mice showed that the two genes, A^y for yellow coat and *T* for brachyury, which are both lethal when homozygous, could be carried in the heterozygous condition by the same animal.

A mosaic (dark-eyed intense–pink-eyed dilute) coat colour of the house mouse, H. W. Feldman (*Jour. Genet., 30 (1935), No. 3, pp. 383–388*).—The author describes the occurrence of 2 mosaics for dark-eyed intensity and pink-eyed dilution in the house mouse. These were produced among the 53 progeny of parents which were hybrids between a pink-eyed self-stock and a dark-eyed, piebald, nonagouti mosaic stock. The latter carried dominant anemic white spotting. Aberrant chromosome division in the somatic tissue is suggested as the explanation. When mated together 13 young were produced, and there were nearly 500 progeny in other matings, including sire to daughter, but there were no mosaics.

Linkage of pink-eye and albinism in the deer-mouse, F. H. Clark (*Jour. Heredity, 27 (1936), No. 7, pp. 259, 260*).—The progeny of mice produced by crossing pink-eyed and albino mice back to pink-eyed albinos were classified as 12 agouti, 62 pink-eyed, and 78 making up the two classes albinos and pink-eyed albinos, both of which are phenotypically alike. The crossover percentage was 15.8±1.99. Attention is called to the homologous nature of the genes for albinism and pink-eyed dilution of the Norway rat, the house mouse, and other mice.

Linkage studies in the rat, E. Roberts and J. H. Quisenberry (*Amer. Nat., 70 (1936), No. 729, pp. 395–399, fig. 1*).—Data are reported from the Illinois Experiment Station on the characteristics of the progeny from matings of diheterozygotes to double recessives, and from matings between heterozygotes, which showed that the gene for dilution in the rat (E. S. R., 62, p. 822) recombines independently of the genes for hair and hairlessness, agouti and nonagouti, self color and hooded, and red eye and dark eye in the rat. Data on tests of linkage between other characters in the rat are also presented.

[The genetics of the fowl.—IV.] Linkage relations of crest, dominant white and frizzling in the fowl, D. C. Warren and F. B. Hutt (*Amer. Nat., 70 (1936), No. 729, pp. 379–394*).—Data bearing on linkage of the genes for the incompletely dominant characteristics of crest, dominant white, and frizzling in the fowl, obtained at the Kansas and Minnesota Experiment Stations, are presented in continuation of this series (E. S. R., 69, p. 31).

In backcrosses of the double heterozygotes for crest and dominant white to double recessives, there was found to be considerable variability in the crossing over in different families, but the average for 1,984 gametes produced by both sexes was 12.5 percent. The crossing-over percentages between the dominant white and frizzle genes was 17.1 percent and between the crested and frizzled

genes was 29.4 percent, based on 1,105 and 677 gametes, respectively. No double cross-overs were found among 284 gametes in backcross matings of triple heterozygotes to triple recessives, although six were theoretically expected if crossing-over in one region did not interfere in another region. The failure of double cross-overs to appear was also confirmed by the map distances for the three genes arranged in the order Cr–I–F. Although differences were small, there was evidence that greater amounts of crossing-over occurred in females than in males.

A study of the relation of cerebral hernia to crest in different types of matings supported evidence that it is ordinarily due to the homozygous expression of the crest gene, but many irregularities were found. The hernia may appear in the heterozygote or be suppressed in the homozygote. Characters independent of the Cr–I–F linkage group are tabulated.

Genetics of the fowl.—V, The modified Frizzle, F. B. Hutt (*Jour. Genet., 32 (1936), No. 2, pp. 277–285, pl. 1*).—Continuing the above series of studies, the occurrence of a recessive autosomal gene which causes partial suppression of the frizzled plumage of heterozygous Frizzles is noted. This gene is independent of the gene for frizzling, and a symbol of *mf* is proposed for it. This modifier when homozygous is manifested in all birds heterozygous for frizzling and in about 40 percent of those homozygous for frizzling. The modified heterozygotes may show only a slight ruffling of body feathers but always have abnormal wing feathers, while the modified homozygotes show less curling of feathers on all parts of the body. This gene is apparently widely distributed among domestic fowls.

[Immunogenetic studies of dove and pigeon species] (*Jour. Expt. Zool., 73 (1936), Nos. 1, pp. 85–108, fig. 1; 2, pp. 285–318*).—Results are reported in the following papers from the Wisconsin Experiment Station:

Immunogenetic studies of species and of species hybrids in doves, and the separation of species-specific substances in the backcross, M. R. Irwin and L. J. Cole.—A study of the species serological relation between the Ring dove and the Pearlneck and F_1 hybrids between them, employing serum from rabbits immunized to the red cells from each of the three groups, showed a new substance not present in either of the parents in the cells of the hybrids. This emphasizes the complexity of the composition of the red cells and difficulties encountered in seperation.

Immunogenetic studies of species and of species hybrids in pigeons, and the separation of species-specific characters in backcross generations, M. R. Irwin, L. J. Cole, and C. D. Gordon; *Immunogenetic studies of species and of species hybrids from the cross of Columba livia and Streptopelia risoria*, M. R. Irwin and L. J. Cole.—In serological studies on the common pigeon, *Columba livia*, and the domestic ringdove, *Streptopelia risoria*, and crosses between them; and the common pigeon, *C. livia*, and the triangular spotted pigeon, *C. guinea*, and crosses between them, the results were similar to those noted in the above paper in that the different species possessed in their erythrocytes biochemical components in common and, in addition, components characteristic of each species. The corpuscles of the F_1 birds contained substances common to both parents and, in addition, new substances not present in the cells of either parent, thus emphasizing the quantitative nature of the genetic factors controlling the biochemical composition of the red blood cells.

Reproduction of the bank vole (Evotomys glareolus, Schreber), I, II, (*Roy. Soc. [London], Phil. Trans., Ser. B, 226 (1936), No. 531, pp. 71–120, pls. 6, figs. 15*).—A detailed description is given of the phenomenon associated with reproduction in the female and the male bank vole in the two following

papers: (1) The Oestrous Cycle of the Female, by F. W. Rogers Brambell and I. W. Rowlands; and (2) Seasonal Changes in the Reproductive Organs of the Male, by I. W. Rowlands.

Effect of light on reproductive cycle of Peromyscus leucopus noveboracensis, W. L. WHITAKER (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 329, 330, fig. 1*).—In a study of the effect of light on the sexual cycle of *Peromyscus*, it was found that a group exposed from 13 to 18 hr. daily to illumination from a sun lamp from September 23 to December 28 was 6 to 8 weeks ahead of a control group in appearance of the sexual season as measured by the descended or enlarged testes and open vagina.

Light regulation of sexual activity in the male sparrow (Passer domesticus), G. M. RILEY (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 331, 332*).—Exposure of sparrows to additional light in November stimulated spermatogenesis and changed the bill color to that of the sexually active bird. On the other hand, only juvenile birds were affected by similar light treatments starting on September 30. Thus, a seasonal rhythm as well as the environmental effect on the sexual cycle was evident.

Reaction of rat mother to retention of near term dead fetuses, A. M. CROSMAN (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 360–362*).—The results of several experiments in which near-term dead fetuses were left in the uterus or placed in the abdominal cavity of the rat demonstrated that such do not necessarily result in the death of the mother.

The comparative behavior of mammalian eggs in vivo and in vitro.—II, The activation of tubal eggs of the rabbit, G. PINCUS and E. V. ENZMANN (*Jour. Expt. Zool., 73 (1936), No. 2, pp. 195–208, figs. 2*).—Continuing this series (E. S. R., 75, p. 193), study was made of the stimulation and development of the rabbit ovum in vitro by fluids free of sperm or containing dead sperm. Dispersal of the follicle cells was caused by a heat-labile substance in the sperm or by trypsin solution. Polar body formation was induced by hypertonic solutions or by a temperature of 45° to 46° C. Parthenogenetic development in vivo was induced by injecting sperm exposed to ultra-violet irradiation into the upper portion of the fallopian tube following mating with a sterile buck.

Influence of elimination of spermatocytes on the development of the male secondary sex characters [trans. title], S. A. IVANOVA (IWANOWA) (*Biol. Zhur., 3 (1934), No. 3, pp. 508–512, figs. 8; Ger. abs. p. 512*).—Destruction of the germinal epithelium of white rats by X-rays indicated that the male hormone was produced in the complete absence of germinal tissue from the interstitial tissue or the Sertoli cells.

Mammary gland development in the hypophysectomized albino rat, R. P. REECE, C. W. TURNER, and R. T. HILL (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 204–207*).—In studies of the relation of the pituitary to mammary gland development at the Missouri Experiment Station, 5 immature female and 4 immature male rats were hypophysectomized and injected with 25 to 500 international rat units of benzoate of hydroxyestrin (Progynon-B) per day from 15 to 45 days. There was no evidence of mammary gland growth, although control animals with pituitary glands and similarly treated developed an extensive duct system with numerous end buds.

Non-effect of estrogenic hormones on mammary gland of hypophysectomized guinea pig, E. T. GOMEZ and C. W. TURNER (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 320–322*).—Injections at the Missouri Experiment Station of estrogenic hormones for 20 to 65 days into nine hypophysectomized guinea pigs stimulated extensive nipple development, but the mammary

duct system failed to grow except in four animals incompletely hypophysectomized.

Function of pituitary grafts in mice, R. T. HILL and W. U. GARDNER (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 78, 79*).—Intra-testicular grafts of pituitary tissue in 2 hypophysectomized mice were found to maintain the normal function of the genital organs and, in one case, an ovarian graft in the testes.

Reaction of anterior pituitaries of immature female rats to injections of various amounts of oestrin, J. M. WOLFE and C. S. CHADWICK (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 56–58*).—Injections of doses of 10 and 200 units of oestrin for 5 and 10 days in different series into immature rats caused degranulation of the eosinophiles and basophiles of the anterior pituitary glands, although more oestrin and more time were required for the effect on the eosinophiles than on the basophiles. The degranulated cells appeared to give rise to chromophobes.

On the influence of oestrin injections on the balance between the prehypophyseal gonadotropic hormones of the male rat, A. LIPSCHÜTZ (*Quart. Jour. Expt. Physiol., 25 (1935), No. 2, pp. 109–120, figs. 3*).—The administration of urine from pregnant mares to adult male rats diminished the luteinizing faculty of the anterior lobe of the hypophysis as determined when the hypophysis was subsequently administered to immature females and the results compared with those obtained from the administration of hypophysis from untreated normal males to immature females. Oestrin injections in adult males caused a disturbance in spermatogenesis.

Ovaries of immature female rats receiving pregnancy urine extract and combinations of pregnancy urine extract and oestrin, J. M. WOLFE (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 26–29*).—Data are presented on the effect of administration of the anterior pituitary-like substance from pregnancy urine (Follutein), alone and in combination with oestrin, on the size of the ovaries and corpora lutea of immature rats. The results showed that the oestrin injections augmented the action of A. P. L. on the weight of the ovaries by causing an increase in the size of the corpora lutea.

Prolongation of the corpus luteum in the pseudopregnant rabbit, W. M. ALLEN and G. P. HECKEL (*Science, 84 (1936), No. 2172, pp. 161, 162*).—Injection of oestrin prolonged the duration of corpora lutea for as long as 25 days after sterile mating. When the ovaries were removed, lactation occurred and in a few cases nesting.

Reactions of immature rabbit ovary to gonadotropic extracts, C. BACHMAN (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 33–37*).—Studies are reported on the effect on the ovary of administering extracts of sheep anterior pituitary and oestrin-free extracts of pregnancy urine to 15-, 30-, 45-, 60-, and 90-day-old rabbits. After 15 days' treatment, the youngest group to show responses was 45 days old. Several well-formed corpora lutea were present in some of the ovaries of these animals, and large luteinized polyhedral cells were present in the ovarian stroma of others. The appearance of the polyhedral cell type is apparently normal, but it disappears following hypophysectomy. Progestational uterine reactions were also noted. In very young rabbits, gonadotropic extracts may produce corpora lutea without the progestational uterine reaction.

Action of oestrin on the vagina during lactation, M. VOTQUENNE (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 207, 208*).—Injections of doses of oestrin greater than one rat unit into lactating animals caused epithelial

keratinization of the vagina characteristic of oestrin. The anti-oestral action of corpora lutea of lactation was observed when doses of less than one rat unit were administered.

Local uterine growth in untreated ovariectomized rabbits, S. R. M. Reynolds and S. Kaminester (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 69, 70*).—By attaching pellets within the uteri of pseudopregnant ovariectomized rabbits, it was found that the physical distention was a potent stimulus for the local growth occurring during pregnancy in view of the fact that any possible hormonal influence from the ovary was eliminated.

The physiology of pregnancy in the rat: An hormonal investigation into the mechanism of parturition. Effect on the female rat of the ante-natal administration of oestrin to the mother, A. M. Hain (*Quart. Jour. Expt. Physiol., 25 (1935), No. 2, pp. 131–143, pl. 2*).—Study was made of the effect on pregnant rats of the administration of oestrin oxytocin and the anterior pituitary-like hormone, alone or in combinations. The results measured in 302 pregnant rats were somewhat irregular, but abortion, absorption, dead litters, and prolonged gestation were frequent. The administration of placentae, hypophyses, uteri, and blood of parturient rats did not cause abortion. The process of parturition was observed under ether anaesthesia and described.

Extraction of gonadotropic factors from the blood. Improved technic, R. T. Frank and U. J. Salmon (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 363, 364*).—A refinement in the method of extracting gonadotropic and oestrogenic hormones from the blood (E. S. R., 75, p. 614) is noted. Strong follicle-stimulating and luteinizing effects have been obtained from 40 cc of blood from normal women at the ninth to the thirteenth day of the cycle, or from castrates, as well as after the menopause.

Bioassay of galactin, the lactogenic hormone, W. H. McShan and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 50, 51, fig. 1*).—Studies of the proliferation of the crop gland of pigeons in response to administration of galactin at the Missouri Experiment Station showed maximum sensitivity in the region of a 50 percent response. A pigeon unit of galactin was defined as the amount of hormone injected during the period of 4 days which will cause a minimum but definite poliferation of the crop glands of 50 percent of common pigeons weighing approximately 300 g.

Glutathione concentration and hereditary size.—V, Comparative studies with Barred Plymouth Rock and White Leghorn embryos, P. W. Gregory, V. S. Asmundson, and H. Goss (*Jour. Expt. Zool., 73 (1936), No. 2, pp. 263–284, figs. 6*).—Continuing this series from the California Experiment Station (E. S. R., 74, p. 473) study of over 300 Barred Plymouth Rock and White Leghorn embryos of each breed incubated from 5 to 19 days showed that the glutathione concentration of Barred Plymouth Rock embryos was slightly but consistently greater at all ages than for the White Leghorn embryos. The differences in glutathione concentration were correlated with the differential rate of cell proliferation, which is more rapid in the larger breeds.

Effects of different temperatures in the incubator on the prenatal and postnatal development of the chick, A. L. Romanoff (*Poultry Sci., 15 (1936), No. 4, pp. 311–315, fig. 1*).—Data are reported on the hatchability, incubation period, weight of eggs, mortality of brooded birds, crippled chicks, and weight at 3 weeks of age as influenced by different incubation temperatures ranging from 35° to 40.5° C. and from 29.5° to 41.5° after 16 days in studies at the [New York] Cornell Experiment Station. The results showed that temperatures in continuous exposure above 38° or below 37° lowered hatchability, but following the sixteenth day of incubation, temperatures could be lowered as much as 3°

without producing ill effects. High and low extremes markedly increased the numbers of crippled chicks.

The artificial control of sex in mammals [trans. title], V. N. SHRÖDER (W. SCHRÖDER) (*Biol. Zhur., 3 (1934), No. 3, pp. 465–467, figs. 3; Ger. abs., p. 476*).—Progress was made in the separation of X- and Y-bearing sperm of rabbits by cataphoresis and temperature changes. Sperm near the anode at a low temperature of 10° C. and in a glycocoll solution and at pH of 7 were largely X-bearing, whereas at the higher temperature of 25° C. the sperm were largely Y-bearing.

FIELD CROPS

[**Field crops experiments in Georgia**] (*Georgia Sta. Rpt. 1936, pp. 8–11, 12–14, 19, 21, 22, 25, 39, 40, 41, figs. 3*).—Progress results (E. S. R., 74, p. 828) are reported from research at the station and Mountain Substation including breeding work with cotton, oats, wheat, and peanuts for disease resistance; a variety test with potatoes; other cotton studies, including the nutrition of the plant, and the use of magnesium, gypsum, and sulfur in fertilizers; tests of corn and sorghum for silage and of flax for fiber; and crop rotations.

[**Agronomic practices in soil conservation**] (*U. S. Dept. Agr., Soil Conserv. Serv., 1935, SCS–TP–2, pp. [2]+7, pls. 4; 1936, SCS–TP–3, pp. 5; SCS–TP–4, pp. 15; 1935, [SCS–TP–8], pp. 3; 1936, SCS–TP–9, pp. 5; SCS–TP–10, pp. 6*).—Practical information is given in multigraphed circulars entitled Strip Cropping, by L. Carrier and W. V. Kell; Improvement of Permanent Pastures, and Grass in Soil Erosion Control, both by L. Carrier; The Role of Strip-Cropping in Erosion Control in the Blacklands of Texas, by E. B. Deeter; Strip Cropping for Sandy Loams of Region 4, and Crop Adaptability for Erosion Control Under Southern Conditions, both by B. H. Hendrickson.

Effects of summer soil-conserving crops on yields of other crops: A summary of experimental work done in the Southern Region and nearby States (*U. S. Dept. Agr., Agr. Adjust. Admin., South. Region Agr. Conserv., No. 1 (1936), pp. IV+64*).—All available data secured in experiments by experiment stations in the South and showing the effects of summer soil-conserving crops on yields of succeeding crops of cotton, corn, oats, wheat, and hay and the effects of interplanting summer soil-conserving crops on yields of corn and oranges are summarized.

Effects of summer cover crops on crop yields and on the soil.—I, Yields of corn and sweetpotatoes following summer cover, W. E. STOKES (*Florida Sta. Bul. 301 (1936), pp. 3–13*).—Corn and sweetpotatoes were grown in 2-yr. rotations in Florida pusley or Mexican clover (*Riohardia scabra*, a nonlegume), *Crotalaria striata*, velvetbeans, beggarweed, and cowpeas, respectively, on a Norfolk medium fine sand (deep phase). Respective yields of top growth of the cover crops in pounds per acre of air-dry material, 8 percent moisture, for the period averaged 1,085, 4,552, 1,323, 648, and 1,698. Sweetpotatoes rotating with voluntary Florida pusley, 1925–28, averaged 20.8 bu. per acre, with *C. striata* 38.9, with velvetbeans 26.9, with beggarweed 23.4, and with cowpeas 27.9 bu. Respective average yields of corn in rotations with these cover crops, 1925–27, were 8.7, 16.6, 16.8, 12, and 14.2 bu. per acre. The effects of these summer cover crops on the nitrates and organic matter content of the soil are noted on page 307.

Effects of winter soil-conserving crops: A compilation of experimental work on winter soil-conserving crops in the Southern Region and nearby States (*U. S. Dept. Agr., Agr. Adjust. Admin., South. Region Agr. Conserv., No. 2 (1936), pp. IV+54*).—This publication includes a digest of all available experiments with winter soil-conserving crops, published by experiment stations in

the South since 1910 (and in a few cases earlier), and considers the effects of winter soil-conserving crops, as winter legumes and rye, on yields of cotton, corn, peanuts, pecans, wheat, sugarcane, and kale; the effects of dates and methods of turning under winter soil-conserving crops and liming on yields of succeeding crops; and the effects of inoculation, seeding methods, cutting dates, and fertilization on yields of winter soil-conserving crops.

The value of winter green manure crops, H. B. SPRAGUE (*New Jersey Stas. Bul. 609 (1936), pp. 19, fig. 1*).—Effects of various winter green manures on yields of the following corn crop were determined, 1929–33, with each green manure sown each year on the same respective plats which were cropped uniformly to corn. The green manure crops were planted in standing corn on Sassafras sandy loam in late August and plowed under the following spring about May 1. Complete fertilizer was broadcasted yearly at the rate of 400 lb. per acre.

Legume green manures greatly surpassed rye and wheat in improving yields of the following corn crop. Vetch increased grain yields 27.8 percent, crimson clover 15.6, red clover 14.7, sweetclover 13.7, wheat 0, and rye −4.7 percent. Corn stover yields were less significantly affected than grain yields. Vetch increased stover yields 19.1 percent, crimson clover 6.9, and rye −6 percent. The total corn crop, with stover and grain in terms of actual feed units for dairy cows, was increased 25.5 percent by vetch, crimson clover 13.3, red clover 11.9, sweetclover 11.3, wheat 1, and rye −4.9 percent. The value of the green manures was correlated closely with the total amount and with their percentage of nitrogen contained. Vetch plants analyzed 3.49 percent nitrogen and contained 133 lb. nitrogen per acre, crimson clover 3.03 percent and 92.4 lb., and rye 1.29 percent and 31.8 lb. per acre. Vetch produced tops and roots equivalent in yearly acre weight to 9.53 tons of fresh manure and in nitrogen content to 14.45 tons of manure, crimson clover 7.62 and 10.04 tons, and rye to 6.16 and 3.46 tons of manure, respectively.

Growth of the various green manure crops did not appreciably affect the rate of lime depletion or the supply of readily available soil phosphorus. Green manures did not prevent but apparently retarded deterioration in soil structure expressed as a lowering of water-holding capacity, in comparison with continuous corn without green manures. Although green manuring failed to maintain the supply of soil organic matter, it retarded the rate of loss under continuous corn culture.

More general use of winter vetch and crimson clover on cornfields to be cropped to corn the following year seems warranted. Broadcasting in late August, without cultivation to cover the seed, produced excellent stands in 3 successive years, and is recommended as an economic planting method.

Rates of seeding small grains and winter legumes for hay, R. P. BLEDSOE and S. J. HADDEN (*Georgia Sta. Bul. 194 (1936), pp. 12, figs. 4*).—In rate of seeding experiments with oats and hairy vetch, oats and Austrian peas, and wheat and Austrian peas, and each crop alone, 1932–36, satisfactory yields came from all plats except where vetch or Austrian peas were seeded alone. Rates of 10 or possibly 20 lb. of hairy vetch or 15 lb. of Austrian peas seemed adequate for combination with oats or wheat. Seeding 60 lb. of oats or wheat per acre in combination with a winter legume gave best yields. Wheat and Austrian peas yielded about as much as oats and Austrian peas. Hay of hairy vetch and oats contained a much higher percentage of legumes than hay of Austrian peas and oats. The legume content of the hay rose with the rate of seeding Austrian peas or hairy vetch and decreased with the rate of seeding oats or wheat. The relative merits of oats and wheat for hay are discussed.

Fertilization of alfalfa on alkaline calcareous soils, W. T. McGeorge and J. F. Breazeale (*Arizona Sta. Bul. 154* (*1936*), *pp. 26, figs. 7*).—Alfalfa grown under irrigation on phosphate-deficient soil at the station in 1934 and 1935 received ammonium phosphate 5 days after the first cutting, drilled at rates of 100, 200, 400, and 600 lb. per acre and in irrigation water 5 and 25 p. p. m. The crop usually was irrigated twice between each of six cuttings. The nitrogen and phosphorus contents of the hay and the phosphorus and potassium in the soils were determined for each plat.

The results indicated that where phosphate deficiency exists in alfalfa fields, an initial application of 200 lb. per acre of ammonium phosphate or treble superphosphate followed by an annual application thereafter of 100 or 200 lb. is advisable. The fertilizer could more profitably be applied by drill than by solution in the irrigation water. The experiments showed that phosphate fertilizer adds to the value of the hay by appreciably increasing phosphorus content with a small increase in nitrogen and therefore protein. Any question of phosphate deficiency in an alfalfa field could be quickly determined, for the response in all cases was indicated by a growth response which appeared in 3 weeks after the fertilizer was applied.

Effects of delayed harvesting by picking and snapping on six varieties of cotton, J. F. O'Kelly and W. W. Hull (*Mississippi Sta. Bul. 316* (*1936*), *pp. 17, figs. 4*).—In harvesting studies, 1931–33, with six varieties of cotton ranging in boll size from very small to medium big and in plant character from dwarf with light foliage to tall and heavy foliage, lint cotton could be obtained early in the season 2.11 times as fast by snapping as by picking, and the ratio rose to 3.91 by the last harvest. The rate at which varieties could be snapped varied 24 percent and the rate of picking varied 38 percent. The larger boll types could be harvested fastest by either method. The amount of cotton per acre apparently did not affect the efficiency of workers except where the yield was very light.

Price premiums decreased on picked cotton with increase in damage due to delayed harvesting and rain. Discounts for snapped cotton varied widely but were usually greatest late in the season. Prices for snapped and picked lint of the same cotton harvested on the same date differed at times as little as 40 points and over 140 points. The price differential as indicated by value per acre was decreased materially by the increased yield of snapped cotton over picked due to inclusion of plant parts. Probably this would not prevail if snapping should become a general practice.

Delayed harvesting affected the seed chiefly by increasing the free fatty acid content of the oil and by decreasing viability. Varietal differences were not great in this respect.

Gin damage of cotton in relation to rainfall, G. R. Smith (*North Carolina Sta. Bul. 306* (*1936*), *pp. 26, figs. 6*).—An investigation in cooperation with the U. S. D. A. Bureau of Agricultural Economics, 1933–35, involving many thousands of cotton samples from a number of gins in the principal cotton-growing districts of North Carolina ginned during the months of August to December, inclusive, showed that the percentage of gin-damaged cotton is highest at the beginning of the season, decreases rapidly each month until November, and remains about the same through December. A closer relationship appeared to exist between rainfall and gin damaged during the early part of the harvest season. At this time the water content of the plant and seed is higher, and the same amount of rainfall is more effective. The cotton reduced one or more grades, due to the lint being damaged during ginning, amounted in the fall of 1935 to 9.3 percent, in 1934 9.5 percent, and in 1933 5.2 percent. Each year the

percentage damaged was higher in the Tidewater and the Coastal Plain areas than in the Piedmont and Slate Belt areas.

Practical conclusions are that cotton farmers can improve the grade of their cotton and promote good ginning by bringing the ginner cotton in good ginning condition. Although cotton should be harvested promptly, it should not be picked while wet or too green. Cotton if picked damp or green should be allowed to dry before taken to the gin, for if ginned while containing excessive moisture the lint will be damaged and more lint will be left on the seed.

Studies in Indian fibre plants.—No. 4, The root-system of sunn-hemp (Crotalaria juncea L.), R. D. Bose, M. A. Aziz, and M. P. Bhatnagar (*Indian Jour. Agr. Sci., 6 (1936), No. 2, pp. 351–360, pls. 2*).—The series (E. S. R., 52, p. 523) is continued. The root systems of 24 sunn hemp cultures derived at Pusa from material collected from different parts of India were studied for 2 yr. As in the case of gram (E. S. R., 71, p. 187), mesophytic and xerophytic root systems were recognized and differentiated. In the mesophytic type the taproots had shallower depths and the secondary roots had a greater spread than in the xerophytic type. Cultures collected from the alluviums invariably had a mesophytic root system, whereas cultures from the drier localities exhibited the xerophytic type.

Oats in North Dakota, T. E. Stoa, R. W. Smith, and C. M. Swallers (*North Dakota Sta. Bul. 287 (1936), pp. 36, figs. 4*).—The results of extensive variety tests with oats, 1922–35, sometimes in cooperation with the U. S. Department of Agriculture, are reviewed, and information is given on varietal characteristics, the status of the crop in North Dakota, its requirements and utilization, the quality of varieties for feed, and on oats diseases and their control.

Grown principally for feed and largely fed on the farm where grown, the oats crop occupies from 6 to 10 percent of the cropped land, averaging about 2,000,000 acres during the last 20 yr., with an annual production of about 50,000,000 bu. Decline in acreage during the last 15 yr. is attributed to a distinct reduction in horse population and to a shift to and increase in other feed crops.

Early-maturing varieties do best in eastern and southern North Dakota and are preferred for the heavier and more fertile soils. Gopher and Iogold are high-yielding early varieties. Midseason oats, better suited to the lighter soils, are usually grown except in the southeastern part of the State. Victory, the commonly grown midseason oats, has been outyielded by Rainbow, especially in the eastern and southern half of the State, and by Anthony in the northern sections. White Russian is the principal late-maturing variety.

Study of relation of growth to nutrition of the rice plant, L. C. Kapp (*Arkansas Sta. Bul. 335 (1936), pp. 33*).—The effects of different elements in soil cultures and nutrient solutions on the growth of rice were studied to determine more about the requirements of rice plants and possibly a method by which field yields might be increased economically. See an earlier note (E. S. R., 68, p. 24).

The rice seedlings grew to maturity in nitrate nitrogen or ammonium nitrogen solutions. The toxic effect of manganese and iron in nutrient solutions was decreased by addition of a greater concentration of nitrogen or calcium compounds. In nutrient solutions 10 p. p. m. of nitrogen produced more grain than a lower or higher concentration, ammonium nitrogen appearing to be slightly superior to nitrate nitrogen.

Large applications of nitrogenous materials on Clarksville soils increased rice yields, whereas phosphorus and potassium did not result in an increase. Addition of calcareous materials within limits increased straw and grain yields on the acid Clarksville soil, but not on the nonacid Crowley rice soil used.

Addition of basic nitrogenous fertilizers on Clarksville soil produced more grain than the acid fertilizers, although large additions of nitrate at frequent intervals gradually decreased yields. Ammonium sulfate was more effective in increasing yields on the nonacid rice soil.

Straw from plants grown on Clarksville soil contained more calcium, iron, and manganese than that from the rice-soil plants. The poor yielding plants tended to be low in calcium and high in nitrogen, manganese, and iron. Ammonium sulfate tended to increase the calcium in plants on the Clarksville soil, and sodium nitrate to decrease it.

Acids added to the two soils increased the solubility of calcium, iron, and manganese and increased the yield of rice, especially on the rice soil. The rice soil with acid treatment alone gave a comparative yield of 330.1 percent, while the 800-lb. application of ammonium sulfate gave an increase of 199.6 percent. The growth of rice evidently can be increased greatly on the nonacid rice soil by nitrogenous fertilizers plus the acid treatments. On soil uncropped to rice and acid, the acid treatments would produce small rice growth.

"The control of the soil reaction in such a manner as to regulate the amount of calcium in solution or possibly the relationship between the iron and manganese or both with the calcium and nitrogen appears from the data accumulated to be partially the solution of the rice problem or at least to be valuable leads to other problems with rice fertilization."

Soybean varieties for hay, seed, and oil production, C. K. McClelland (*Arkansas Sta. Bul. 334 (1936), pp. 42, figs. 2*).—Chiquita, the standard soybean variety for seed production at the station, led all varieties grown, 1925–35, but was surpassed, 1927–35, by four new U. S. Department of Agriculture introductions and, 1931–35, by Arkansas Selection Nos. 151 and 200, Mamredo No. 607, and Harbinsoy. In hay yields, 1925–35, Delaware Nos. 1838 and 1846 and U. S. D. A. No. 35623 slightly outyielded Chiquita, which averaged 2.31 tons. Arksoy, Southern Prolific, Tokio, Laredo, Delsta 6676, Delta 6677, and Arkansas Selection Nos. 151, 157, and 200 were nearly equal or superior in certain limited periods.

On upland at the Cotton Substation, Laredo, the standard in seed production, was outyielded by Tanloxi, Delsta No. 6676, Mammoth Brown, Arksoy, Tokio, Mamredo, White Biloxi, Mamloxi, Loxitan, Mammatan, U. S. D. A. Nos. 71605 and 71168-91425, and Ebony. On delta land, Laredo was exceeded by 21 varieties, including several Delta selections, Biloxi or Otootan hybrids, and several strains of Arksoy. In hay production on upland, Laredo was led by Otootan, Arksoy Nos. 2908 and 2913, Delsta No. 6676, Tokio, Biloxi, White Biloxi, and Tanloxi. On delta land, besides the varieties which led on the upland, several new U. S. Department of Agriculture introductions were superior. At the Scott experimental field, 1923–29, Laredo, Shanghai, Biloxi, Chiquita, and Mammoth Brown led in seed yields, and these soybeans and Otootan in hay production.

At the Rice Substation, Mammoth Brown was the standard and leading variety in seed production, although in the last 3 yr. White Biloxi has been outstanding. Delta selections and Biloxi and Mammoth Yellow crosses were among the highest in seed yield. In hay yield, Otootan is included with the varieties named as a superior soybean.

At the Fruit and Truck Substation, Arksoy, Shanghai, Mamredo, Tokio, and Mammoth Brown led in seed production, and Mungbeau, Mammoth Yellow, Arksoy, Mamredo, and Shanghai in hay production.

Oil content of the soybeans ranged from 13 to 23 percent, with most of the varieties near 18 percent as an average. Data on other agronomic characters and on the variability of hay yields are appended.

Proceedings of the International Society of Sugar Cane Technologists, Fifth Congress, Brisbane (*Brisbane: Exec. Com., 1936, pp. XVIII+887, [pls. 67], figs. [110]*).—The session of this Congress, held August 27 to September 3, 1935, comprised general and sectional meetings dealing with cultural and field practices, varieties, diseases and insect pests, and factory operation and chemical control.

Papers of special interest to the agronomist included Economics of Sugar in Australia, by P. H. M. Goldfinch (pp. 21–28); Report of Committee on Labor Saving Devices, by W. J. Maze (pp. 53–67); Caneland Cultivation in Queensland (pp. 71–80); Gyrotilling at Aguirre, Puerto Rico, by A. L. Foss (pp. 81–86); Note on the Maturity Experiments Being Conducted in Barbados, by G. P. Stevenson (pp. 164, 165); A Note on Methods of Maturity Determination in South Africa, by H. H. Dodds (pp. 165, 166); Maturity Determination in Queensland, by H. W. Kerr (pp. 166–172); The Top/Bottom Ratio Method for Determining the Maturity of Sugar Cane, by B. Viswa Nath and S. Kasinath (pp. 172–189); Cane Trash and Soil Organic Matter, by C. R. von Stieglitz (pp. 191–197); Frost Damage in Cane and Some Experiments to Minimise Its Intensity, by F. M. Barton (pp. 210–213); Report of the Committee on Field Experimentation, by H. W. Kerr (pp. 244–278); Methods of Selecting Seedlings at the Sugar Cane Breeding Station in Barbados, by A. E. S. McIntosh (pp. 324–326); Methods of Selecting Seedlings, by R. L. Davis (P. R.) (pp. 326, 327); Methods of Selecting Seedlings at the United States Sugar Plant Field Station, Canal Point, Florida, by G. B. Sartoris (U. S. D. A.) (pp. 328–333); Method of Selecting Cane Seedlings in the Everglades as Practised at the Florida Agricultural Experiment Station, by B. A. Bourne (Fla.) (pp. 333–338); A Brief Account of Selection Methods at Present Used in Mauritius, by A. Glendon Hill (pp. 339–341); The Methods of Selecting Seedlings Practised by the Colonial Sugar Refining Company, Ltd., by H. F. Clarke (pp. 341, 342); Methods of Seedling Selection in Queensland, by E. J. Barke (pp. 343, 344); Methods of Selecting Seedlings as Adopted at Coimbatore, by T. S. Venkatraman (pp. 344–347); Sugar-Cane Breeding in Hawaii, by A. J. Mangelsdorf (Hawaiian Sugar Planters' Station) (pp. 348–356); Irrigation in the Lower Burdekin District, by B. Tapiolas (pp. 412–423); Drainage Methods in Fiji, by H. F. Clarke (pp. 425–429); Surface Drainage in the Mackay District, by F. E. M. Clarkson (pp. 430–434); Variation Within a Clonal Population, by A. F. Bell (pp. 557–562); The Maintenance of First-Year Characters in New Sugar Cane Clones, by A. Glendon Hill (pp. 563–567); Determining Theoretical Yields of Sugar in Connection With Sugar Cane Variety Tests on the Basis of Field Sampling and Laboratory-Scale Milling Tests, by G. Arceneaux (U. S. D. A.) (pp. 568–578); Report of the Committee on Soils, by O. Schreiner (U. S. D. A.) (pp. 604–608); Soil Fertility Studies With Mauritius Soils, by N. Craig (pp. 609–616); Juice Analyses in Relation to the Fertilizer Requirements of Barbados Soils, by S. J. Saint (pp. 616–623); Soil Analytical Methods Employed in Queensland, by H. W. Kerr and C. R. von Stieglitz (pp. 624–630); Rapid Field Tests for Soil Fertility, by C. R. von Stieglitz (pp. 631–634); Methods Used by the Division of Soil Fertility Investigations to Determine the Fertilizer Requirements of Sugar Cane in Louisiana, by A. M. O'Neal and L. A. Hurst (U. S. D. A.) (pp. 636–639); Methods Used by the Division of Soil Fertility Investigations in the Analysis of Sugar-Cane Juice, by N. McKaig, Jr., and L. A. Hurst (U. S. D. A.) (pp. 640–643); Fertilizer Studies on Yazoo and Lintonia Soils, Two Important Sugar-Cane Soils in Louisiana, by A. M. O'Neal, O. Schreiner, and L. A. Hurst (U. S. D. A.) (pp. 644–653); A Brief Review of Some Important Contributions on Soil and Fertilizer Investigations With Sugar Cane (pp. 654–663) and Publications Re-

lating to Sugar-Cane Soil Investigations (Covering Approximately 1931–1933) (pp. 664–706), both by O. Schreiner and R. B. Deemer (U. S. D. A.); A Study of Sugar Cane Stalk Age Groups Under Louisiana Conditions, by G. Arceneaux (U. S. D. A.) (pp. 777–787); Mechanical Help for Field Sampling, by F. D. Stevens (Fla.) (pp. 787–790); Special Three-Roller Mill Used in Sugar-Cane Experimental Field Work, by O. Schreiner and N. McKaig, Jr. (U. S. D. A.) (pp. 790–795); and Portable Scale for Use in Weighing Sugar Cane on the Soil Fertility Experiments in Louisiana, by A. M. O'Neal (U. S. D. A.) (pp. 796–798).

The interests of the chemist and factory technologist were considered in papers entitled Manufacture of Raw Sugar—Australian Practice, by R. W. Harman (pp. 44–48); The Automatic Recording and Controlling of the pH of the Thin Juice, by R. E. Simmons (pp. 121–132); The Fundamental Principles of Cane Payment, by G. S. Moberly (pp. 134–144); Sugar Factory pH Control, by V. Khainovsky (pp. 147–159); The Keeping Qualities of Sugar Cane Molasses, by C. A. Browne (U. S. D. A.) (pp. 216–227); The Exhaustion of Final Molasses, by L. I. A. Micheli and O. S. de Gyulay (pp. 229–241); The Control of the Boiling of Shipment Massecuites, by L. I. A. Micheli (pp. 286–298); Notes on Raw and Refined Cane Sugar Boiling, by C. W. Waddell (pp. 298–306); A Summary of the Experiments Done on Viscosity and Electrical Conductivity of Sugar Solutions at Java Sugar Experiment Station, 1927–1934, by P. Honig (pp. 313–317); The Problem of Evaporation and the Efficient Utilization of Steam in Sugar Factories, by R. Neumann (pp. 522–534); Milling Practice, by E. W. Marriott (pp. 542–548); Hymers Compound Maceration System, by W. Hymers (pp. 550–555); Improving the Refining Quality of Export Sugar at Tuman Mill, Peru, by J. A. Solano (pp. 740–753); Preliminary Report on Refining Quality of South African Raw Sugars, 1934–35 Season, by F. W. Hayes (pp. 753–759); The Refining Quality of Sugars in the Mackay District: Report Covering Research Work for 1933 and 1934 Seasons, by V. Thorp (pp. 759–765); Refining Quality of Raw Sugar, by R. W. Harman (pp. 765–773); The Normal Weight Question in the Analysis of Sugar Factory Products, by C. A. Browne (U. S. D. A.) (pp. 830–832); and Report of Special Committee on Uniformity in Reporting Factory Data, by F. W. Zerban (pp. 834–852).

A compilation of experimental and other data on harvesting, curing, marketing, and feeding sweet potatoes, compiled by C. F. Clark (*Mississippi Sta. Bul. 315 (1936), pp. [2]+42*).—Information compiled from reports of State experiment stations and the U. S. Department of Agriculture covers the harvesting of sweetpotatoes; storage, with reference to rot and moisture losses, effects of fertilizers, fungicides in preventing decay, and storage houses; the economics of the crop in regard to production and shipments, price per bushel, and labor requirements of sweetpotato production; and the value of sweetpotatoes as feed for swine and workstock.

The development of the wheat spike, O. T. Bonnett (*Jour. Agr. Res. [U. S.] 53 (1936), No. 6, pp. 445–451, pls. 2*).—The principal stages in the development of the growing point, the spike, and the spikelet of the wheat plant are described from a study at the Illinois Experiment Station, largely with Purkof winter wheat. See also a similar study on barley (E. S. R., 74, p. 628).

In the resting stage of the seed the stem portion of the wheat embryo consists of coleoptile; first, second, third, and fourth leaf initials; the coleoptile tiller bud; and the growing point. Leaf initials appear as alternate ridges nearly encircling the growing point. The ridges are more prominent on the side opposite the leaf initial just below or above it. The prominent portion forms the apex of the young leaf. Leaves elongate by basal growth and grow up inside the preceding leaf.

During fall, winter, and early spring, the growing point remains in the vegetative stage. In fall the growing point produces only leaf initials, while in early spring it also elongates. The beginning of the reproductive stage is marked by appearance of double ridges, the upper of which produces the spikelet and its parts, and during this stage the spikelets and spikelet parts differentiate and increase in size.

Spikelet differentiation begins in the middle of the spike and proceeds toward the base and the tip. Likewise, each of the spikelet parts in the sequence of spikelet development appears first in the spikelets in the middle of the spike. Within the spikelet, differentiation begins at its base and proceeds upward, while within the flower the sequence of differentiation of its members is from the outside inward, the pistil and its parts being the last to differentiate. Spikelet parts differentiate in the order of empty glumes, and flowers 1, 2, 3, etc. Within the flower the order is lemma, anthers, palea, and pistil, and of the pistil parts is ovary, styles, and stigmas.

The wheat spike, a determinate inflorescence, terminates in an apical spikelet placed at a right angle to the plane of the other spikelets. When the spikelets differentiate the number is fixed, but adjustment to growth conditions may be made in the number of fertile flowers in a spikelet.

The planting value of wheat taken directly from farmers' drills, W. F. Crosier (*New York State Sta. Bul. 677 (1936), pp. 30, figs. 7*).—Examination of 120 samples of seed wheat, collected in 1935 directly from New York farmers' drills, for purity, germination, and disease organisms was supplemented by information obtained from the farmers on cleaning, disease treatment, and seed sources. Only 10 percent of the samples had been purchased from dealers and but 4 of these were certified. Only 35 percent of the farmers knew the variety they were planting and varietal mixtures were very common. Most of the samples had been cleaned; cleaned samples averaged 99 percent in purity and uncleaned stocks 95. Cockle was present in 76 samples, and seeds of chess, quackgrass, wild buckwheat, and wild mustard were frequent. Treatment for disease control received very little consideration by farmers, although a fungicide could have been applied profitably to 90 percent of the seed stocks. The survey demonstrated the need for the wider use of certified seed, increased efficiency of cleaning mills, and the general adoption of safe and effective chemical methods for disease control.

Agricultural seed, A. S. Lutman (*Vermont Sta. Bul. 410 (1936), pp. 16*).—The germination and purity guaranties and important variations therefrom are tabulated and discussed from tests of 590 samples of agricultural seed collected from dealers in Vermont during 1936. Relatively few lots were found deficient as to purity or viability.

Methods for inspection of commercial legume inoculants, A. W. Hofer (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 655–671*).—This survey of the more important papers concerned with methods for legume inoculant inspection, embracing 159 titles, is a contribution from the New York State Experiment Station. Suggested possibilities for improvement include a change from the current plan of examination for nodules to one measuring the benefit conferred upon hosts by individual cultures and improvement of inspection by use of a simple greenhouse efficiency test that correlates fairly well with field results.

The control of creeping Jennie, A. L. Bakke (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 287–290, fig. 1*).—A popular discussion of results obtained by the Iowa Experiment Station in controlling bindweed by cultural methods and by sodium chlorate sprays.

HORTICULTURE

[Horticultural studies by the Georgia Station] (*Georgia Sta. Rpt. 1936, pp. 33–37, 39, 40, 41–43, figs. 3*).—There are presented brief progress reports on tomato variety and fertilizer trials; the relationship of potash to the thickness of the fruit wall in the pimiento pepper; irrigation of vegetables; fertilizer and variety trials with beans; nitrogen requirements of the Elberta peach; varietal trials of peaches, plums, and bush fruits; culture of the red raspberry; selection of pears for blight resistance; and breeding and propagation of the Muscadine grape.

Variety and cultural trials with fruits and vegetables at the Mountain substation are briefly discussed.

Fertilizers for Irish potatoes, sweet potatoes, tomatoes, muskmelons, and watermelons, J. R. COOPER and V. M. WATTS (*Arkansas Sta. Bul. 333 (1936), pp. 32*).—Based on experiments conducted over a period of years at the main station and at the Fruit and Truck Substation near Hope, the authors present information on the fertilizer requirements of potatoes, sweetpotatoes, tomatoes, muskmelons, and watermelons. In general, the results showed that each crop has rather definite needs influenced by the type of soil upon which grown. The degree of slope of the fields did not cause appreciable differences in response to fertilizer, nor did variation in weather from year to year promote any differences in response that could be detected.

On Clarksville silt loam at Fayetteville, potatoes appeared to require a fertilizer mixture of a 1–3–1 ratio, sweetpotatoes a 1–4–2 ratio, and can-crop tomatoes a 3.5–10–1 or a 3.5–10–0 ratio. On Ruston fine sandy loam near Hope, potatoes responded favorably to a 3–3–2 ratio, sweetpotatoes to a 1–1–1 ratio, tomatoes to a 2–2–1 ratio, muskmelons to a 1–2–1 ratio, and watermelons to a 5–6–3 ratio. For tomatoes at Fayetteville, barnyard manure appeared profitable in fairly liberal amounts when obtainable on the farm. Applications of fertilizer in a broad strip under the row and well mixed with the soil before planting was effective. It is urged that phosphorus, because of its rapid fixation, be worked deeply into the soil.

The influence of commercial fertilizers upon the firmness and chemical composition of strawberries and tomatoes, I. C. HAUT, J. E. WEBSTER, and G. W. COCHRAN (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 405–410*).—Using medium-sized berries of uniform maturity, there was found, on the basis of 4 years' records taken by the Oklahoma Experiment Station on the Aroma strawberry, no significant effect of fertilizer treatment on the firmness of the fruit. High nitrogen in the fertilizer resulted in larger berries and leaves. In the case of Pritchard tomatoes, no difference in keeping quality could be associated with any of the fertilizer treatments. Keeping quality of tomatoes was rather closely associated with freedom from bruises and mechanical injury and also with the storage temperature.

Chemical analyses of representative samples of strawberries and tomatoes failed to show any significant differences that could be attributed to the differential fertilizer treatments. In the strawberry there was a slight increase in the total sugars associated with the lower nitrogen applications and also some increase in nitrogen associated with high-nitrogen treatments. Moisture was somewhat higher in the berries from the nitrogen than from the no-nitrogen plats. Marked seasonal differences occurred, but the relative differences between treatments were essentially the same from year to year.

Comparative suitability for freezing purposes in 14 varieties of garden or snap beans grown under eastern conditions, H. H. MOON, J. S. CALDWELL,

J. M. LUTZ, and C. W. CULPEPPER (*Canning Age, 17 (1936), Nos. 7, pp. 271–275, 284, 290; 8, pp. 306–308, 327*).—In 1934 and 1935, 12 green and 2 yellow varieties were harvested at 3 different stages of development, prepared by standard methods, and packed with and without the addition of brine preliminary to freezing at 15° F. and storing at 0°. An examination after 5 mo. showed 3 varieties, namely, Giant Stringless Green Pod, mosaic-resistant Stringless Green Refugee, and Kentucky Wonder pole, to be best adapted to freezing preservation as indicated in color, freshness, and palatability when cooked. Four others, Asgrow Stringless Green Pod, Burpee Stringless Green Pod, U. S. No. 1, and Round Pod Kidney Wax, compared very favorably with the first 3, but the remaining 7 were distinctly poorer in quality. The size of container had no material influence on keeping quality, and it was evident that even at 0° beans can be held for only a few months, sufficient, however, to meet the usual commercial requirements. Storage above 0° is considered inadvisable.

Suitability of lima beans for freezing, J. S. CALDWELL, J. M. LUTZ, and H. H. MOON (*Canning Age, 17 (1936), No. 10, pp. 374–378, 393–395*).—A total of eight varieties, namely, Giant Podded and King of the Garden poles, and Burpee Improved, Dreer, Fordhook, Henderson, Wood Prolific, and New Philadelphia bush varieties, were compared as to color, freshness of appearance, and palatability after freezing storage under different conditions. Younger beans of all varieties retained their attractiveness when frozen, but older beans yellowed somewhat. All factors being considered, the King of the Garden, Giant Podded, and Dreer were superior for freezing purposes.

Beans were equally well preserved in nonairtight paper containers and in hermetically sealed cans, and straight or dry packs were equal in all respects to those in brine.

A temperature as low as 0° F. is considered absolutely essential to the keeping of lima beans, and even at 0° the duration of successful keeping is limited to a few months.

Irrigation of cantaloupes, W. M. FLEMING (*Sci. Agr., 16 (1936), No. 12, pp. 634–643, fig. 1; Fr. abs., p. 643*).—Applying different quantities of water to Hale Best cantaloups growing at the Dominion Experimental Station, Summerland, B. C., it was found over a 3-yr. period that 0.5 in. weekly applications resulted in the greatest total yields and the largest number of high-grade melons. Chemical analyses of soil suggested that leaching of nitrogen from the upper soil layer may have been responsible, in part at least, for reducing yields on excessively irrigated plats. However, no significant differences were established in sugar content of comparable melons harvested from the heavily and lightly irrigated areas.

Determining changes in stored peas by use of a reference element, C. S. BISSON, H. A. JONES, and H. W. ALLINGER (*Hilgardia [California Sta.], 10 (1936), No. 6, pp. 143–165*).—Observations at the California Experiment Station at Davis on changes occurring in pods and seeds of Laxton Progress peas, harvested at the marketable stage and stored under different conditions, showed phosphorus to be the most consistently uniform element in percentage composition. Phosphorus was selected, therefore, as the basis for calculating absolute weights of various components.

As regards dry matter, in shelled peas stored at 25° C. 12 percent of the original amount was lost in 112 hr. In pods, the loss amounted to 14.2 percent. In unshelled peas, there was a rapid translocation of the dry matter from the pods to the peas causing an actual increase in the peas. At 3.5° the various processes were greatly slowed down.

At 25° the changes in weight of carbon closely paralleled those in dry weight. At 3.5° the percentage of carbon in shelled peas remained fairly constant, with a loss of about 3.7 percent in 188 hr.

A rapid decrease occurred in the percentage of total sugar in shelled peas held at 25°. Total sugars also decreased rapidly on a weight basis, with only 11.6 percent left after 112 hr. Unshelled peas retained their sugar more effectively than shelled. At 3.5° shelled peas had 61 percent of their sugar after 188 hr. Starch increased until the third day in shelled peas held at 25° and then decreased. Under like conditions, shelled pods lost starch during the entire period. At 3.5° shelled peas gained slightly in starch both on a percentage and weight basis. Shelled peas stored at both 3.5° and 25° increased in crude fiber both on a percentage and weight basis, with more rapid changes at the higher temperature.

In both peas and pods stored shelled at 25° there was noted a slight increase in the percentage of nitrogen attributable to the decreasing weight of dry matter. There was a small loss in nitrogen by weight. At 3.5° there was very litle change in the percentage of nitrogen in shelled peas or pods after 188 hr. Phosphorus on a percentage basis increased in both shelled peas and pods at 25°. In unshelled peas, there was a considerable increment in the weight of phosphorus. In both peas and pods stored shelled at 3.5°, the weight of phosphorus remained constant, although the percentage increased due to respiration loss in dry matter. At 25° magnesium percentage gained in both peas and pods stored in the shelled state. There was a slight percentage increase at 3.5°.

Some factors influencing growth and fruit-setting in the pepper (Capsicum frutescens L.), H. L. Cochran (*[New York] Cornell Sta. Mem. 190 (1936), pp. 39, pl. 1, figs. 17*).—Studies made of plants of an improved strain of the World Beater variety, grown in the greenhouse under controlled environmental conditions and also in the field, indicate that several factors, including unfavorable temperature, unfavorable water supply, and inadequate nitrogen supply, are among the causes of the dropping of buds, blossoms, and immature fruits. Temperature was found to have a greater effect on the time of bud formation, anthesis, and fruit maturity than any other factor studied. Plants made their maximum growth under conditions of high soil moisture and very high soil fertility in a 70°–80° F. greenhouse. Higher temperature reduced growth, apparently due to a lack of carbohydrates as a result of excessive respiration and a lack of water, due to the smaller root system and increased transpiration. Growth between 60°–70° approximated that in the field. Supplementary light in fall, winter, and spring increased the growth of plants in the 60°–70° and the 70°–80° greenhouses. Temperature had a profound effect on fruit setting, the range of effective temperature being comparatively small with no fruits setting between 90°–100° or between 50°–60°. Plants grown under a low soil moisture produced a small total number of blossoms and set a smaller percentage than did plants with medium or high soil moisture and, in general, plants with high soil nitrogen set significantly better than those with a low nitrogen supply. With the variety used, hand pollination did not significantly increase set and, in fact, emasculated covered blooms set as well as pollinated blooms. Plants from which 60 percent of the leaves were kept removed set about as well as nondefoliated plants. A study was made of the abscission layer and the process of abscission and of the embryo sacs in abscissed and setting fruits. It was noted there was a degeneration of the embryo sacs in the fruits dropping from the 90°–100° plants.

Transport of root-forming hormone in woody cuttings, W. C. Cooper (*Plant Physiol.*, *11* (*1936*), *No. 4*, *pp. 779–793*, *figs. 8*).—Stating that it has long been recognized that if stems of various woody plants are girdled roots push forth from above the wound, the author suggests, from girdling experiments conducted at the California Institute of Technology with lemon shoots, that some root-forming substance in the plant is transported downward in the phloem and impeded by the girdling operation. When the bases of lemon cuttings were treated with a heteroauxin solution, the number of roots per cutting was increased. If, however, the treated portion was then cut away and the new base again treated with heteroauxin, there was no further stimulation. This indicated that other factors besides heteroauxin are concerned in root stimulation. The author suggests that the heteroauxin induces the rapid downward movement of a substance, rhizocaline, which is necessary to root formation. The possibility of using the heteroauxin treatment in stimulating the rooting of difficult species, such as apple and holly, is discussed.

Phosphate response with closely planted one-year-old fruit trees, O. Lilleland (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 114–119*, *fig. 1*).—Plantings, 5 by 5 ft., of apple, apricot, peach, and prune trees established by the California Experiment Station on a soil near Paradise, Calif., characterized by a high degree of phosphorus deficiency, showed limited response to 20 lb. of treble superphosphate placed in each hole at the time of setting. The apples showed the most striking response of any of the fruits, shown in larger and darker green leaves with a glossy surface. Less than 20 lb. of phosphorus material failed to give an equal response. Shoot growth was increased in all four species, but, on the whole, the growth of the checks would be considered satisfactory. In the apple, the phosphorus treated trees showed an average trunk cross sectional increase of 49 percent above that of the controls. Odds of 49 to 1 by the Student method indicates a significant top: root ratio increase in the phosphated apples but, strangely, no significant increment in the other three species. The leaves of closely planted phosphated apple trees contained three times as much phosphorus as those of comparable controls. In the case of regular spaced trees supplied with 50 lb. of treble superphosphate injected as a solution into the underlying soil to a depth of 3 ft., the leaves failed to show any significant increment in phosphorus as a result of the treatment. Apparently, the phosphorus applied in solution was fixed before it could be utilized by the tree, and the need of even greater applications was indicated.

Studies of fall and spring applications of nitrogen fertilizers to apple trees, G. E. Smith (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 120–123*, *figs. 2*).—Observations by the Missouri Experiment Station, following applications at different seasons of different forms of nitrogenous fertilizers to 15-year-old Golden Delicious and Gano apple trees growing in bluegrass sod, indicated that under proper conditions cyanamide, nitrate of soda, and sulfate of ammonia are effective sources of nitrogen for apple trees. It was evident that rainfall and soil moisture conditions have a pronounced effect on the rate of decomposition and penetration of cyanamide into the soil. With no rainfall, the granules remained on the surface and lost 65 percent of their nitrogen after 2 weeks, but the calcium hydroxide induced sufficient alkalinity so that the granules contained 2.4 percent dicyanodiamide nitrogen. Twenty-eight days after application, the top 4 in. of soil contained 14 p. p. m. of dicyanodiamide nitrogen. Where rain fell, no cyanamide, dicyanodiamide, or urea was found after 10 to 14 days. Fall applications of nitrate of soda leached rapidly, and, in some instances, after 1 week the second 4 in. of soil contained more nitrogen than did the upper 4 in. With spring applications, penetration was not so

rapid. With the exception of the first fall application, nitrogen from cyanamide was taken up as rapidly as that from the other two materials. With both fall applications, the initial absorption was greater with nitrate of soda. However, the cyanamide and sulfate of ammonia maintained a higher rate of absorption through the winter, and in spring the roots of the trees receiving these two materials were, in general, higher in nitrogen than those receiving nitrate of soda. Bluegrass absorbed nitrogen most rapidly from nitrate of soda, next, from sulfate of ammonia, and slowest from the cyanamide. Under conditions of normal rainfall, cyanamide is little more slowly available than is sulfate of ammonia.

Apple breeding studies.—I, Fruit color, A. N. Wilcox and E. Angelo (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 108–113*).—Observations by the Minnesota Experiment Station on a total of 1,709 apple seedlings, resulting from crosses made in the 1918–20 period, showed that Oldenburg and Okabena varieties, both of which have medium red striped fruits, probably carry a single principal gene for red striping. Delicious is also believed to be in the same group. King David and Jonathan, dark red apples, carry, apparently, additional or polymeric genes for red. Winesap, Wealthy, and Wolf River are also believed to carry polymeric genes. Except in the case of Grimes Golden × Oldenburg, the reciprocal crosses yielded much the same type of seedlings. In this particular cross, when Oldenburg was used as a pollen parent, there were 48 percent striped seedlings, whereas the reciprocal yielded approximately 98 percent. The progenies with the largest percentage of dark red seedlings were those with King David, Jonathan, Wealthy, or Winesap as parents.

A study of blossom bud differentiation in the McIntosh variety of apple, I. Aaron (*Bul. Torrey Bot. Club, 63 (1936), No. 5, pp. 259–275, pls. 2*).—An examination at the Pennsylvania Experiment Station of buds taken at different intervals during the growing season from McIntosh spurs 2 yr. old or more showed a well-defined correlation between the time of year that buds were collected and both the breadth of the primordial meristem and the differentiation of this meristem into a blossom bud. Rather than one, there was evidently a succession of quiescent stages in which the rate of morphological change declined. Meristem breadth is believed to be a more definite indicator of blossom bud differentiation than is the shape of the provascular form. On the basis of the diameter of the primordial meristem, the author believes that rough predictions are possible at any time during the growing season as to the probable blossom bud formation.

Relative effect upon peach production of nitrogen derived from certain fertilizer sources, C. A. McCue (*Peninsula Hort. Soc. [Del.] Trans., 49 (1935), pp. 10–12*).—Comparisons at the Delaware Experiment Station of dried blood, nitrate of soda, ammonium sulfate, tankage, cowpea cover crops, barnyard manure, and a mixture of nitrate of soda and ammonium sulfate as sources of nitrogen for Elberta peaches showed over a period of 10 yr. that the largest yields resulted from the combined nitrate of soda and ammonium sulfate treatment. A study of yearly records showed some indication that the effective source of nitrogen may vary with the age of the trees. Cowpeas provided sufficient nitrogen in the early years, but as the trees grew larger failed to meet the needs.

New peach varieties, F. F. Cowart (*Georgia Sta. Circ. 109 (1936), pp. 4*).—Brief descriptions are presented of several new varieties of peaches developed by the New Jersey Experiment Stations, the Ontario Horticultural Experiment Station, Vineland, the Michigan Experiment Station, and elsewhere.

Development of cherry and peach fruits as affected by destruction of the embryo, H. B. Tukey (*Bot. Gaz.*, *98* (*1936*), *No. 1*, *pp. 1–24*, *figs. 7*).—In developing a technic whereby the embryo could be killed in fruits while still attached to the tree, the author found, in this study conducted by the New York State Experiment Station, that the effect of the embryo destruction was closely correlated with the stage of development of the fruit at the time of the operation. Destruction during stage 2, that is, the period of retarded development of the pericarp, resulted in shriveling and abscission, whereas destruction in the period of final enlargement, stage 3, resulted in increased growth rate and earlier maturity of the fruit. The nearer the normal ripening date, the greater was the increased growth rate of the pericarp following injury to the embryo. The author suggests that in early ripening varieties of cherry and peach the abortion of the embryo influences pericarp development rather than vice versa.

Apricot thinning investigations, D. V. Fisher (*Sci. Agr.*, *16* (*1936*), *No. 12*, *pp. 644–651*, *fig. 1*; *Fr. abs.*, *pp. 650*, *651*).—Since the thinning of the fruits of vigorous 10-year-old apricot trees growing at the Dominion Experimental Station, Summerland, B. C., to 2 and 4 in. apart just after the June drop failed to exert any material influence on the percentage of No. 1 fruits and reduced the total crop significantly, the author concludes that thinning of apricots is a laborious and ineffective practice. The position of the fruit on the tree appeared to be the most important factor determining size, those on the upper exposed branches being largest irrespective of thinning treatments. Time of thinning exerted very little influence on the size of fruit, but very late thinning did retard ripening. Thinning tended toward more even maturity.

Several branches on a 16-year-old Royal tree were thinned so as to leave 0, 2, 6, 10, 14, 18, and 22 leaves per fruit. The silze of apricots increased until a maximum of 10 leaves was reached. The completely defoliated branch matured its fruit about 10 days late, but the quality was such as to suggest that there is a comparatively ready translocation of nutrients from branch to branch in the apricot.

Seasonal changes in nitrogen and carbohydrate content of the strawberry plant, J. H. Long (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 386–388*, *figs. 4*).—Analyses at the Missouri Experiment Station of Aroma strawberry plants grown outdoors in 5-in. pots containing rich loam and sampled at different stages of development showed an increase in total nitrogen until November, at which time nearly 80 percent was in the leaves. As the leaves yellowed, there was an increment of total nitrogen in the roots and stems. With the development of new leaves in spring, all woody structures showed a decrease in nitrogen, which continued through fruiting and runner production. Obviously, the roots and stems served as storages for nitrogen in winter. Young leaves contained from 6 to 7 percent of total sugars and from 4 to 5.5 percent of reducing sugars. The percentage of starch in both roots and stems increased rapidly in autumn, until in late autumn the roots contained 75 percent of the total starch in the plants. There was evidently a reciprocal relationship between starch and sugar, the sugar requirements of the flowers and fruits being met, apparently, by hydrolysis of starch and hemicelluloses. At the approximate point of highest sugar content, hemicellulose was at its lowest point.

Phosphorus deficiency in citrus, A. R. C. Haas (*Soil Sci.*, *42* (*1936*), *No. 2*, *pp. 93–117*, *pls. 6*).—Growing lemon and orange trees in soil, sand, and solutions, the author observed in these experiments, conducted by the California Experiment Station at Riverside, that citrus trees can withstand a deficiency of P for a considerable time and may, under favorable conditions, within a few days absorb sufficient P to meet needs for an extended period. The shoots and

bark were the first portions of the plant to have the percentages of organic P fraction reduced to a trace when P was omitted from the culture solution. The percentages of phospholipid P were highest in the leaves even after prolonged P starvation. Symptoms of P deficiency in leaves were variable, sometimes consisting of a fading of the chlorophyll, reduction in size, change of color to dull brownish-green, or even burning. In severe cases the lemon leaves drooped at the petiole and later abscised. In the absence of P in the culture solution, silica supplied as silicic acid appeared to improve growth.

Granulation of oranges, L. D. Batchelor (*Calif. Citrogr., 21 (1936), No. 11, p. 416, fig. 1*).—The author discusses the work of the California Experiment Station at Riverside on the citrus granulation problem and points out that simply spraying the trees with whitewash reduced the extent of the trouble about 50 percent. There was some indication that a reduction in irrigation decreased the amount of granulation, and the individual tree appeared to be a factor, some being characterized by a large percentage of granulated fruits. Propagations were made of trees with and without notable tendencies to granulation in order to study the inheritance of granulation. The author suggests that granulation is probably associated with an excessive transpiration of the fruits during their growth.

Pyrethrum in Tennessee, B. D. Drain (*Tennessee Sta. Circ. 59 (1936), pp. 4, figs. 4*).—Information is presented on botanical relationships, present sources of pyrethrum, the status of production in the United States, work of the station in developing strains with high pyrethrin content, and general cultural and harvesting requirements.

Studies on pyrethrum (Chrysanthemum cinerariaefolium Trev.) in Egypt.—I, M. Shafik and A. H. Hindi (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 166 (1936), pp. [1]+24, pls. 7*).—This is a general discussion of cultural methods, chemical composition, methods of analysis, the best stages of maturity for harvesting, and the effects of soil, temperature, etc., on pyrethrin content.

FORESTRY

[Forestry studies by the Georgia Station] (*Georgia Sta. Rpt. 1936, pp. 43–45*).—Included are brief reports on projects dealing with thinning in second growth oak stands and the germination and survival of yellow poplar.

Ohio Forest News, [September 1936] (*Ohio Forest News [Ohio Sta.], No. 29 (1936), pp. 8, figs. 3*).—In the usual manner (E. S. R., 75, p. 634), brief popular notes are contributed upon forestry activities such as the development of a State program, 4-H planting, forest taxation, etc.

Drouth damage to prairie shelterbelts in Minnesota, M. E. Deters and H. Schmitz (*Minnesota Sta. Bul. 329 (1936), pp. 28, figs. 11*).—Preceded by a succession of dry years, the very drastic season of 1934 resulted in tremendous injury to shelterbelt trees in western and southern Minnesota. A total of over 179,000 trees located on 665 farms in 11 townships, distributed throughout the region, were examined. Of the 28 species considered, 5, namely, boxelder, willow, green ash, silver maple, and cottonwood, made up about 90 percent of the total, American elm constituted 3.5 percent, and poplars, Scotch pine, western white spruce, and Chinese elm combined to make 4 percent, leaving only 2.5 percent for all other species. Approximately 40 percent of all the trees examined were dead or dying at the end of 1934. Among species, green ash was an outstanding exception with only 8 percent classified as dead or dying. Boxelder, willow, silver maple, and cottonwood occur naturally in river bottoms and were manifestly poorly adapted for planting on upland prairie sites. Green

ash, bur oak, and American elm, natural inhabitants of the dry soils, appeared best suited among native species for shelterbelt plantings. From observations on different sized trees, it was evident that young trees, once well established, are better able to withstand drought than are older trees. Environment and spacing were also factors in survival.

There was a definite indication that shelterbelts and windbreaks in the prairie region have suffered from overcutting with a consequent depletion in the total amount of timber. Essentially, the available volume of timber in the region is entirely inadequate to meet the fuel and other wood requirements. Proper methods of planting and managing shelterbelts are discussed, and a program of planting, adequate to meet the needs of the region, is outlined. Appended are notes on hardwood and coniferous species suggested as suitable for planting in the Minnesota prairie region.

First thinning in white pine plantations, R. T. CLAPP (*Jour. Forestry, 34 (1936), No. 10, pp. 928–935, figs. 2*).—This is a brief discussion of methods followed in making the first commercial thinning in plantations of white pine located in the Eli Whitney Forest near New Haven, Conn. A total of 25,000 bd.-ft. of lumber and 53 cords of fuel wood were obtained from 29.8 acres.

Norway spruce in the northeastern United States: A study of existing plantations, N. W. HOSLEY (*Harvard Forest Bul. 19 (1936), pp. 80, figs. 9*).—Based on observations in 57 plantations in New England and New York, ranging between 7 and 70 yr. of age, and on an extensive study of the literature, the author presents information on the distribution of the Norway spruce, its silvicultural requirements, lumber-producing capacities, growth, insect and fungus enemies, pruning, etc.

Variations in the wood of yellow poplar from the southern Appalachian region, B. H. PAUL and N. A. NORTON (*Jour. Forestry, 34 (1936), No. 10, pp. 936–942, figs. 4*).—Observations on cross sections of trunks collected from 60 trees grown in 4 States showed, in general, that wood from old trees has a lower average specific gravity than that from younger trees in the same forest. Measurements of hardness showed greater variability than did specific gravity. There was some indication that yellow poplar from Kentucky and Tennessee averages heavier than that from North Carolina or West Virginia. In the 1,823 samples examined, the range in specific gravity was from 0.27 to 0.55, a variation said to be much larger than occurs ordinarily in other native species. The practical application of the study in the selection of yellow poplar logs for particular uses is pointed out, and weight is conceded a satisfactory measure of the general character of yellow poplar wood.

Dimension-stock methods for New England hardwoods, A. O. BENSON (*U. S. Dept. Agr. Circ. 394 (1936), pp. 61, figs. 42*).—This circular presents information on equipping and operating a dimension-stock mill, its purpose being to simplify the problems confronting a prospective operator or one contemplating changes in an established plant. The mill planned is a composite of a large number of plants employing a wide variety of machines, lay-outs, and operating methods. The machines suggested are those which have given proof that they are particularly well adapted to a plant of this type.

DISEASES OF PLANTS

The Plant Disease Reporter, October 15 and November 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 18, pp. 283–298, figs. 2; 19, pp. 299–309*).—Among other items of interest, these issues contain the following notes:

No. 18.—Tobacco disease field survey in Wisconsin, 1936, by J. Johnson; crop disease survey in Massachusetts (August-September 1936), by O. C. Boyd; brittle root of horseradish in Illinois and vegetable diseases in Illinois in 1936, both by K. J. Kadow and H. W. Anderson; bacterial canker (*Aplanobacter michiganense* = *Phytomonas michiganensis*) in Georgia-grown tomato plants, by H. T. Cook; canning bean diseases in New York in 1936, by A. L. Harrison and W. H. Burkholder; varietal susceptibility of lima beans to mosaic, by A. L. Harrison; rust of beans in New Jersey, by C. M. Haenseler; internal browning of watermelon, by M. B. Hardy; and brown spot (*Physoderma zeae-maydis*) and bacterial stalk rot (*Bacterium dissolvens* = *Phytomonas dissolvens*) of corn near Cairo, Ill., in 1936, by B. Koehler.

No. 19.—Detection of *Anguillulina dipsaci* in bulbous iris, by R. J. Hastings and J. E. Bosher; scab (*Cladosporium pisicolum*) of peas found in Maine, by D. Folsom; asparagus rust (*Puccinia asparagi*) prevalent in New Jersey this year, by C. M. Haenseler; plant disease notes from Massachusetts, by E. F. Guba; fruit diseases in Massachusetts this year (1936), by O. C. Boyd; and some epixylous fungi of Maine (listing 73 wood-inhabiting fungi collected in Maine, 1933–35, including nine first reports from the State, one first report outside of Pennsylvania, and one first report from a coniferous substratum), by M. T. Hilborn and F. H. Steinmetz.

Estimates of crop losses from diseases in the United States in 1935, compiled by H. A. Edson, J. I. Wood, and N. W. Nance (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 94, pp. 43–75*).—Crop losses from various diseases are tabulated for wheat, barley, rye, oats, field corn, sweet corn, sweetpotato, potato, tomato, snap bean, dry bean, green peas, cotton, sugar beet, pear, apple, peach, cherry, grape, and strawberry.

[Phytopathological studies by the Georgia Station] (*Georgia Sta. Rpt. 1936, pp. 23–25, fig. 1*).—Progress reports are given on winter injury of peach trees in relation to fertilization; tomato selection in relation to wilt resistance; selection for resistance to *Fusarium* wilt of watermelon; root rots of snap beans (*Rhizoctonia*, *Sclerotium rolfsii*, and *Fusarium*); control of oat smut; and diseases of vetch and Austrian winter peas.

A preliminary list of the parasitic fungi of Idaho, A. L. Schade (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 95, pp. 77–113*).—This preliminary list is limited, for the most part, to those fungi parasitic on herbaceous plants, and cultivated hosts receive more attention than wild hosts. With few exceptions, all collections reported are deposited in the herbarium of the department of plant pathology of the University of Idaho.

The material here presented includes an annotated systematic list of fungi, a host index, and a bibliography of 65 titles.

Relation of root pressure to plant disease, J. Johnson (*Science, 84 (1936), No. 2171, pp. 135, 136*).—This paper from the Wisconsin Experiment Station emphasizes that water soaking of tissues associated with high root pressure predisposes plants to certain bacterial invasions.

Detection and identification of seed-borne parasites, W. F. Crosier (*Assoc. Off. Seed Anal. North Amer. Proc., 27 (1935), pp. 87–92*).—This contribution by the New York State Experiment Station gives a review and general account of the subject, with special reference to the experience of this station.

Plant quarantine legislation: A review and a reform, H. T. Güssow (*Phytopathology, 26 (1936), No. 5, pp. 465–482*).—The author briefly summarizes data on the very large sums spent in America on some introduced diseases and pests, reviews the question of plant quarantine legislation in general (embargoes, health certificates, and conditional and restrictive measures), and

proposes certain reforms having to do with plant disease surveys, material other than living plants, the supervision of exports, tolerance and standards, port-of-entry inspection, insurance against interceptions, quarantine and detention services, agreements among groups of countries of similar interests and geographical location, international cooperation in scientific research, and an international advisory council on plant quarantines.

On the classification of plant viruses, J. M. Birkeland (*Phytopathology, 26 (1936), No. 5, pp. 456–458*).—A comparison of results obtained by the serological reactions of plant viruses and their induced or acquired immunity reactions in plants indicated (1) that viruses inducing complete cross immunity are serologically indistinguishable, (2) that those giving partial cross protection are serologically related, and (3) that viruses giving no cross protection are serologically unrelated. The possibility of using serological reactions and induced plant immunity reactions for elucidating the natural relationships of viruses is indicated.

Separation and analysis of virus strains by means of precipitin tests, K. S. Chester (*Phytopathology, 26 (1936), No. 8, pp. 778–785*).—The author describes a modification of the precipitin test whereby strains of a virus may be differentiated. This technic was applied to 10 strains of tobacco-mosaic virus and to 3 of latent potato-mosaic virus, serological differences being detected among the strains of each. The tests gave some indication of the genetic or chemical constitution of the strains, since, e. g., masked and yellow tobacco-mosaic strains yielded not only common antigenic material but each also an antigenic fraction peculiar to itself. The fraction peculiar to yellow mosaic was found both in spontaneously occurring yellow mosaic and in yellow strains experimentally isolated from green tobacco mosaic.

Studies in bacteriosis.—XXII, (I) The isolation of a Bacterium associated with "fasciation" of sweet peas, "cauliflower" strawberry plants, and "leafy gall" of various plants, M. S. Lacey (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 302–310, pls. 2*).—An organism isolated from fasciated sweet peas reproduced the condition on inoculation into young seedlings. Bacterial strains similar to this one were also isolated from leafy galls on chrysanthemums, carnations, and *Schizanthus*, and from cauliflower of strawberry. These strains all induced fasciation in sweet pea seedlings both by direct inoculation and by way of inoculated sand cultures. The nonmotile, rod-shaped organism, not identified with any known species, is here given a preliminary description without being named.

Galls produced by plant hormones, including a hormone extracted from Bacterium tumefaciens, N. A. Brown and F. E. Gardner (*Phytopathology' 26 (1936), No. 7, pp. 708–713, figs. 4*).—The growth substances indoleacetic acid and indolepropionic acid, used in a lanolin salve, were applied to decapitated stems and side wounds on stems as a film smear covering the wounds, or to stems without wounding. The plants tested were beans, tobacco, tomato, sunflower, privet, Paris daisy, *Bryophyllum pinnatum*, *Kalanchoe daigremontiana*, and *Impatiens balsamina*. Gall formation was induced by only one application to wounded stems, but apparently a wound is necessary here as in the cases of bacterial- and fungus-induced galls. Tomato and bean stems produced bending and root primordia by surface smearing without wounding, and galls and witches'-brooms were produced on bean plants by decapitating the 0.25- to 0.5-in. growth of stem just above the first two primary leaves and smearing the wound. Bean, tobacco, and sunflower proved most subject to the gall formation thus induced, but Paris daisy, privet, and the *Impatiens* also developed definite galls.

These results suggested the possibility of producing galls with a growth substance from cultures of *Bacterium tumefaciens* [=*Phytomonas tumefaciens*]. This was successfully done, using a lanolin mixture of growth substance extracted in a manner described. In both sets of tests the pure lanolin controls gave negative results.

The occurrence of Gibberella fujikuroi var. subglutinans in the United States, A. J. Ullstrup (*Phytopathology, 26 (1936), No. 7, pp. 685–695, figs. 2*).—Perithecial specimens of this fungus were found on old cornstalks in New Jersey and Ohio. In addition to its distinguishing morphological characters, in the imperfect stage it could be differentiated from its type form, *Fusarium moniliforme* (section *Liseola*), by its more rapid growth rate on several agar media, its more intense stromatic coloration on steam-sterilized rice, etc., and by its lower minimum and optimum growth temperatures. The imperfect stage, *F. moniliforme subglutinans*, proved capable of causing a seedling blight of corn. Certain single ascosporic cultures produced mature perithecia under suitable conditions, indicating the fungus to be homothallic. It is believed that this fungus has recently been introduced into the United States, and that a wider distribution will be found than is here indicated.

A growth factor influencing the development of Ophiobolus graminis Sacc., G. W. Padwick (*Sci. Agr., 16 (1936), No. 7, pp. 365–372; Fr. abs., p. 372*).—*O. graminis* failed to grow in some of the common synthetic liquid media without the addition of certain organic extracts. When casein was extracted with water, the proteins precipitated with alcohol, and the ether-soluble fractions removed, the extract was still active in promoting growth. The same was true when carrots were extracted with water, the proteins precipitated, the ether- and acetone-soluble fractions removed, and much of the sugar precipitated with barium hydroxide. Further studies are deemed necessary to determine whether this growth factor is identical with the second growth factor found by Buston and Kasinathan (E. S. R., 72, p. 30) to be necessary for *Nematospora gossypii*. A culture of *O. graminis* in the basal solution contaminated with bacteria grew well in sharp contrast to noncontaminated cultures. Further tests with cultures of these bacteria indicated that they also contained a factor promoting growth of the fungus.

It is believed that growth factors probably have an important role in maintaining the balance of micro-organisms in the soil.

The determination of physiologic forms of Puccinia triticina Erikss. in England and Wales, F. M. Roberts (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 271–301*).—For the determination of physiologic forms, 46 collections (mostly in England and Wales) of *P. triticina* were tested, the majority being studied as single-spore cultures, and 10 new forms are described for the first time. An apparently inherent instability in the behavior of form 66 is discussed. This form appeared to be the commonest and most widely distributed one in Great Britain. Changes in environmental conditions affected the reactions of some of the differential varieties to certain physiological forms. These are discussed. Infection of certain varieties by *Erysiphe graminis* induced the development of pustules of a susceptible type by some physiologic forms of *P. triticina* to which these varieties were normally resistant.

"The fact that no previously described forms, except forms 15 and 10, have been encountered is discussed. The apparent absence of an aecidial host for *P. triticina* in this country presents a problem as to the origin of the forms found here. It is suggested that mutation may account for the occurrence of some of these forms in view of the origin during the course of this investigation of a variant of form 10 from a culture of form 66, presumably by mutation."

Spreader materials for insoluble copper sprays, H. C. Young and J. R. Beckenbach (*Phytopathology, 26 (1936), No. 5, pp. 450–455, figs. 2*).—In this study at the Ohio Experiment Station, Wyoming bentonite and Wyojel (a treated bentonite) proved very effective as spreaders and stickers for such insoluble copper compounds as basic chloride, basic sulfate, phosphate, and Coposil. Kaolin, talc, and Bancroft clays were much less effective. Wyoming bentonite, a high adsorbing material, proved suitable as a carrier for soluble or gaseous fungicides and insecticides. It flocculates in sprays about as does bordeaux mixture. The sticking tests were made on glass slides.

Effect of seed borne pathogens and of seed disinfectants on the germination of barley seed, R. H. Porter (*Assoc. Off. Seed Anal. North Amer. Proc., 27 (1935), pp. 94–99*).—This contribution by the Iowa Experiment Station deals with *Helminthosporium sativum* causing spot blotch and *Gibberella saubinetii* causing scab, both of which are common pathogens of barley seed. The former produces sparse root development, browning of roots and coleoptiles, and dark-brown conidiophores on the glumes. *G. saubinetii* and related Fusariums on the seed produce a fluffy pink or white mycelium, cause rotting of the roots and stem of the seedling, and in autoclaved soil cause a pronounced seedling blight.

Seed treatment of scabby barley with ethyl mercury phosphate increased the percentage of strong seedlings, reduced that of weak seedlings, and gave a practical control of seedling blight in laboratory soil. It also increased the stand in the field. Autoclaved soil furnished a satisfactory laboratory medium for seed germination which represented subsequent field germination more closely than does the usual germination on moist blotters.

Factors influencing infection of barley by loose smut, R. W. Leukel (*Phytopathology, 26 (1936), No. 7, pp. 630–642*).—Alpha and Wisconsin Pedigree No. 5 varieties inoculated with *Ustilago nigra* were grown at six constant soil temperatures (from 5° to 30° C.), high, low, and medium soil moisture being used for each. The cardinal temperatures for infection were: Minimum below 5°, optimum from 15° to 20°, and maximum above 30°. In general, high soil moisture reduced the percentage of infection while low soil moisture increased it, especially at the extreme. *U. nuda* showed little if any reaction to soil temperature. Infection with *U. nigra* showed no consistent response to differences in soil reaction or soil composition. Indications are that infection by *U. nigra* does not occur after emergence of the first leaf. In general, transfer of the plants after emergence to a soil temperature more favorable or less favorable to infection resulted, respectively, in an increased or decreased percentage of infection.

The biology of oat smuts.—IV, The invasion of some susceptible and resistant oat varieties, including Markton, by selected biological species of smut (Ustilago avenae (Pers.)) Jens and Ustilago kolleri (Wille), J. H. Western (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 245–263, pls. 2, figs. 6*).—Continuing this series (E. S. R., 69, p. 666), *U. avenae* f. L_4 on *Avena strigosa* persisted longer than form L_{11} on the variety Potato, though both these oats failed to produce infected panicles with these smuts. The response of the resistant Markton to attack by six collections of *U. avenae* and *U. kolleri* varied considerably. Forms C_1 and L_{11} failed to penetrate, but form C_4 entered easily and its mycelium persisted for some time.

The types of sheathing structures around the penetrating hyphae and their reaction to microchemical tests were determined in Markton inoculated with forms C_1 and C_4. A hypersensitive reaction resulting in the formation of necrotic areas around the hyphae was found in Markton when invaded by forms C, L_4, and L_5.

The varieties studied are classified according to five grades of resistance offered to particular forms of smut. In oats resistance to smut is expressed in at least three ways, viz, a reaction of the epidermal cell wall preventing penetration, necrosis of host cells, and a retarding effect on the growth of mycelium within the host.

Laboratory detection of smut in oats, G. N. DAVIS (*Assoc. Off. Seed Anal. North Amer. Proc., 27 (1935), p. 93*).—A method for detection of smut in samples of small grains and sorghums is presented by the Iowa Experiment Station, whereby it is believed that the percentage of smutted heads in the field may be predicted. The method is based on the correlation of spore load per kernel with percentage of smutted heads in the field.

Oat smut control, F. VAN HALTERN (*Georgia Sta. Circ. 110 (1936), pp. 4*).—As a result of comparative tests of seed-treatment materials and methods for oats in the hull over a 5-yr. period, Improved Ceresan and formaldehyde dust or spray treatments (described in detail) are recommended. The first named appeared to have more advantages than any of the others tested.

Investigations of the field resistance of individual wheat varieties to Puccinia glumarum tritici [trans. title], O. E. KÜDERLING (*Ztschr. Zücht., Reihe A, Pflanzenzücht., 21 (1936), No. 1, pp. 1–40, figs. 3*).—After describing the general plant and fungus material used in the study (a collection of summer and winter wheat varieties and various races of the yellow rust fungus), the author details the methods and results of extensive varietal resistance tests, including experiments in greenhouse and field on the relations of temperature and of growth stage of the plant to its resistance to attack by this rust fungus.

The results indicated that temperature has an important influence on infection through its effects on both host and fungus. There were host and fungus races which in their reciprocal reaction called forth the severest infection at the cooler temperatures and other host-parasite combinations giving these results only at the warmer temperatures. The high field resistance of some wheat varieties was most closely correlated with temperature and of others with the developmental stage of the plant at the time of attack.

The data obtained are held to indicate that in order to call forth a definite disease picture in a particular variety the reciprocal action of a number of outer and inner factors is necessary. Thus both the "mature plant resistance" to black rust in America (held to be conditioned by the late stage of development of the plant) and the "summer resistance" to yellow rust in Europe (held to be conditioned by temperature influences) are to be considered merely as cases of the predominance of one limiting factor among a complex of influences present. Viewing the data as a whole, there is a long series of different combinations of the factors influencing infection (with all transitional stages), the two examples given lying at the extremes. The problem of field resistance to yellow rust is thus seen to be a complex one, which must be studied from the standpoints of the physiological relations of both host and parasite to each other, to the changing environment, and to the different stages of development.

Eighty-six literature references are given.

The effect of leaf rust accompanied by heat upon yield, kernel weight, bushel weight, and protein content of hard red spring wheat, L. R. WALDRON (*Jour. Agr. Res.* [*U. S.*], *53 (1936, No. 6, pp. 399–414)*.—In this study by the North Dakota Experiment Station, 20 hybrid selections of each of 4 families of a cross were grown in 1934 and 1935. The resistance to leaf rust varied from high to moderate within the families, and the average amount of leaf rust attacking the 2 moderately resistant families varied approximately from 4 to 13 percent from 1934 to 1935. The stem rust effect was very minor. The family showing freedom from leaf rust in both years showed no loss in

yield per acre from 1934 to 1935. With increasing amounts of rust in the other 3 families, yields fell off 16, 19, and 28 percent, respectively. In weight per 1,000 kernels the 4 families, in order of amount of leaf rust, showed decreases of 8, 16, 24, and 29 percent, respectively, from 1934 to 1935. Weight of grain per bushel showed corresponding decreases of 3, 6, 7, and 8 percent. The chances were found to be 370: 1 that the wheats showing least injury from leaf rust in 1935 were less affected in the amount of protein laid down in the grain than were other wheats showing greater injury from leaf rust in 1935 as compared with 1934.

As the main difference affecting the crop in the 2 yr., so far as known, was the markedly greater July heat of 1935, it is concluded that the yield and other losses of 1935 were due to the association of higher temperatures with the effects of the pathogen.

Alfalfa dwarf, a virus disease transmissible by grafting, J. L. Weimer (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 5, pp. 333–347, figs. 3*).—In this cooperative study between the U. S. D. A. Bureau of Plant Industry and the California Experiment Station, the bacteria commonly associated with alfalfa root tissue affected with dwarf were absolved from any causal relation. Healthy alfalfa plants set in soil from about dwarfed plants also failed to become infected, but dwarf spread readily from diseased to nearby healthy plants under natural conditions. In a few instances healthy alfalfa contracted dwarf in soil to which living diseased root tissue was added, but not when stems from diseased plants were mixed with the soil. Water passing about diseased plants and then about healthy ones failed to induce infection. Two lots of cuttings from affected green stems produced 35 and 40 percent of infected plants, respectively. When some of the crown tissue was included at the base of the cutting, 80 percent of infected plants resulted. Leaf mutilation, pinprick inoculation, and the injection of juice extracted from diseased plants failed to transmit. Inserting small pieces of yellow root tissue into healthy roots gave from 0 to 84 percent infection (average, 9 percent). All other parts of the diseased plants used as inoculum gave negative results. Approach grafting of diseased and healthy plants gave from 14 to 75 percent of infected plants (average, 37 percent). Any method of grafting in which a union was formed between diseased and healthy tissue served to transmit dwarf. The highest percentage of infection was obtained when a piece of diseased root was grafted to the lower end of a healthy root by a wedge graft.

It is concluded that alfalfa dwarf is a graft-transmissible virus disease.

The relation of aphids to the transmission of bean mosaic, W. J. Zaumeyer and C. W. Kearns (*Phytopathology, 26* (*1936*), *No. 7, pp. 614–629*).—Although aphids were not ordinarily seen in large numbers feeding on beans in the field, 14 species were found, and it is likely that a careful search would have revealed many others. It is probable that the relative percentage of the different species depends largely on the crop in close proximity. Positive transmission of the bean-mosaic virus was proved for 11 aphid species from 17 hosts, viz, *Aphis gossypii*, *A. medicaginis*, *A. rumicis*, *A. spiraecola*, *Brevicoryne brassicae*, *Hyalopterus atriplicis*, *Rhopalosiphum pseudobrassicae*, *Macrosiphum ambrosiae*, *Illinoia solanifolii*, *I. pisi*, and *Myzus persicae*. *Neothomasia populicola* did not transmit the virus. Transmission with 10 species of insects other than aphids commonly found feeding on beans also yielded negative results. The spread of bean mosaic in the field evidently depends on the prevalence of aphids, as well as on the amount of primary infection appearing early in the season.

A manganese deficiency affecting beans, G. R. Townsend and H. H. Wedgworth (*Florida Sta. Bul. 300* (*1936*), *pp. 23, figs. 6*).—A chlorosis and death of

beans growing on slightly acid or alkaline peat soil is shown to be due to manganese deficiency. Its availability in such soils was increased by acidifying with sulfur, and soil treatments, sprays, and dusts with $MnSO_4$ prevented chlorosis and increased the yield of the beans. In correcting the trouble, iron and zinc could not be substituted for manganese. The effects of soil applications of either sulfur or manganese decreased rapidly. Soil treatment with 25 lb. of $MnSO_4$ and 200 lb. of sulfur per acre should be used each year for the prevention of yellowing on badly burned peat soil, but spraying with $MnSO_4$ solution is considered more economical. Two applications of spray (4–50) are usually sufficient.

Flax seed-treatment tests, H. H. Flor (*Phytopathology, 26 (1936), No. 5, pp. 429–438*).—In this study by the U. S. D. A. Bureau of Plant Industry in cooperation with the North Dakota Experiment Station, Ceresan and copper carbonate dust treatments in controlling diseases and increasing stands and yields of Bison flax were conducted at 11 stations in Minnesota, North Dakota, South Dakota, and Montana (1931–34). Seed-borne diseases of flax were of negligible importance during these 4 yr., and no accurate data were secured on the effectiveness of the different treatments in their control. The treatments had no appreciable effect on wilt incidence in the wilt-susceptible variety Damont or in the wilt-resistant variety Bison in 1 year's trials on wilt-infested and noninfested farm soils. No treatment had a consistently stimulatory effect on either stand or yield, although there was some indication that under certain conditions the Ceresan and copper carbonate-dust treatments benefited the stand in the more humid southeastern Minnesota region. The formaldehyde-spray treatment was distinctly injurious, causing significant reductions in stand in about three-fourths of the tests and in yield in about one-third of the tests in which such data were secured. Treatment of flaxseed is thus apparently not at present justified in the seed-flax producing regions of North Dakota, South Dakota, Montana, or western Minnesota.

The relationship between the serological reactions and the infectivity of potato virus "X", F. C. Bawden (*Brit. Jour. Expt. Path., 16 (1935), No. 5, pp. 435–443*).—A close relationship was found to exist between the antigen content of purified suspensions of the S strain of potato virus X, as measured by their optimum flocculation points with antisera, and their virus content as measured by the local-lesion method. The strengths of such suspensions lay in the same order as compared by either method, but the relationship held only when the suspensions were prepared by the same method. The two methods gave different results when different mixtures of strains of virus X were compared. Strains G and L were serologically indistinguishable from strain S, but produced no local lesions. It is believed that the antisera provide a quantitative method of studying such viruses, and that they also afford a reliable estimate of the total virus in a mixture of strains where the results from lesion counts would be misleading.

Inactivation by heat, aging, or alcohol was accompanied by loss of flocculating power with antiviral sera. Inactivation by formalin did not affect the flocculating power, while phenol reduced and altered but did not completely destroy it. The antigen and virus behaved similarly in their reactions to certain precipitants.

Inoculation of potato seedlings with the yellow dwarf virus, E. J. Wheeler (*Amer. Potato Jour., 13 (1936), No. 8, pp. 221–223*).—As shown in this study by the Michigan Experiment Station, plug grafting is effective in field or greenhouse for transmission of yellow dwarf. This method may be used in testing for resistance and possibly in obtaining a resistant variety. Several seedlings have failed to show the disease either after exposure to heavy field infection or to inoculation by the plug graft.

Breeding for resistance to late blight in the potato, F. J. Stevenson, E. S. Schultz, C. F. Clark, W. P. Raleigh, L. C. Cash, and R. Bonde (*Amer. Potato Jour., 13 (1936), No. 8, pp. 205–218*).—In this contribution by the U. S. D. A. Bureau of Plant Industry in cooperation with the Maine Experiment Station, the authors review previously published work along this line and then detail their preliminary studies as showing that there are different degrees of resistance, and that resistance is definitely inheritable. Though no immune types have been found, a variety satisfactory without bordeaux spraying in a blight epidemic year was obtained by selection from a cross of Chippewa × Katahdin. It is believed that a high degree of resistance to the physiological forms of *Phytophthora infestans* prevalent at Presque Isle, Maine, can be obtained without the aid of species hybrids, and if a heavy epidemic can be induced the results of one year's testing seem reliable. The nature of the resistance has not yet been determined.

Bordeaux spraying in relation to growth rate and yield of potatoes in Nassau County, Long Island, G. F. MacLeod and W. Dickison (*Amer. Potato Jour., 13 (1936), No. 7, pp. 180–184, figs. 2*).—These studies by Cornell University "are believed to indicate that at Hicksville, Long Island, bordeaux mixture has a tendency to increase the total weight of potato foliage, together with the total number of leaflets, and at the same time retard the increase in weight of tubers early in the season. This retardation in weight of tubers may or may not be followed by an increase in total weight of all tubers. It is also apparent from the data that the increased total weight of tubers from sprayed over unsprayed vines resulted from a larger number of smaller potatoes from the former."

Fusarium wilts of potato, their differentiation, and the effect of environment upon their occurrence, R. W. Goss (*Amer. Potato Jour., 13 (1936), No. 7, pp. 171–180*).—This study by the Nebraska Experiment Station appears to indicate that *F. oxysporum*—at least as it occurs in Nebraska, Colorado, and adjoining States—is essentially a stem rot organism. It differs from the more highly specialized species listed as vascular parasites in its wide distribution, occurrence in virgin soils, in the lack of severe and persistent attacks in any one locality, and in its weak parasitism. The data also show that *F. solani eumartii* is not so highly specialized as the vascular parasites, but that it attacks primarily the root cortex and on reaching the stem also invades the cortex chiefly, though it may eventually penetrate all the stem tissues. It is primarily a root rot organism, which sometimes causes a stem rot. It is deemed essential to recognize the difference between these two diseases and the *Fusarium* wilts of other plants caused by the true vascular parasites.

Brown rot of Irish potatoes and its control, A. H. Eddins (*Florida Sta. Bul. 299 (1936), pp. 44, figs. 8*).—The disease is first discussed (including the names, distribution, economic importance, hosts—*Solanum citrifolium*, *S. pyracanthum*, *S. sisymbrii*, and *Datura metel* being listed as new—environal relations, and growth of the causal organism on media), following which the materials, methods, and results of the field experiments from 1929 to 1935 are detailed.

Crop rotation and weed eradication were ruled out as effective control measures. *Bacterium solanacearum* (=*Phytomonas solanacearum*) was killed by H_2SO_4 in potato broth with initial reactions of pH 4.02 and lower and by both H_2SO_4 and HCl in potato-dextrose agar at initial reactions of pH 4.15 and lower. It grew in media of higher initial concentrations and survived at pH 8.71 with NaOH as the alkaline agent. In experimental field plats it was controlled by soil treatment with single doses of inoculated sulfur at from 400 to 1,200 lb. per acre. Yields were reduced, but were recovered when the soil adjusted

itself to a more alkaline condition (naturally or by addition of calcium or dolomitic limestone). The return to a normal pH was not accompanied by a return of brown rot. Hydrated lime at from 1,000 to 2,000 lb. per acre gave some control. Inoculated sulfur (800 lb. per acre) induced reactions lethal to the organism in the upper 8 in. of soil more rapidly when applied in June than in fall or winter.

Under conditions of moderate severity cowpeas as a green manure crop failed to reduce the rate of tuber infection, but when the disease was severe it increased the yield of healthy potatoes by preventing early infection. Corn planted in a severely infected field 3 weeks prior to digging increased tuber infection through injured roots.

The Green Mountain variety proved most resistant and Katahdin second, while Chippewa was most susceptible. In each of five varieties affected, external symptoms were evident in most of the tubers. Infected tubers continued to decay in transit and when stored in a field shed for 8 days.

Bacteriosis of pumpkin fruits in California, P. A. Ark and C. M. Tompkins (*Science, 84 (1936), No. 2166, p. 18*).—This preliminary note from the University of California describes a soft rot of pumpkin shown to be due to bacteria related to *Erwinia carotovora* [=*Bacillus carotovorus*] and capable of inducing rot in various host plants.

Notes on the present sugarcane-disease situation in Puerto Rico, J. H. Jensen (*Puerto Rico Sta. Agr. Notes No. 69 (1936), pp. 8*).—This includes data on the aid given by surveys in guarding against new diseases; the distribution of mosaic in Puerto Rico, its control by resistant varieties or roguing, infection in young fields near hills as higher than near the sea, and the evidence as to the occurrence of two or more strains of virus; gummosis; leaf spot diseases; dry-top rot; red rot; *Fusarium* pokkah boeng disease (*F. moniliforme*); chlorotic streak; manganese deficiency; and on the exclusion of diseases not known to occur in Puerto Rico.

Pythium graminicolum and P. arrhenomanes, C. Drechsler (*Phytopathology, 26 (1936), No. 7, pp. 676–684, figs. 3*).—Though *P. graminicolum* and *P. arrhenomanes* both parasitize sugarcane, being associated abundantly with root rots of this host in the southern United States, they represent two distinct species. A close mycelial connection between oogonium and antheridium, very frequent in *P. graminicolum*, is rare in *P. arrhenomanes*, and in parallel cultures the sturdy, more substantial membranous parts of the sexual apparatus of the former species remain clearly discernible long after the evanescent antheridial envelopes and supporting branches of the latter have become nearly or quite invisible.

A temperature study of Pythium attack on swede seedlings, T. N. Greeves and A. E. Muskett (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 264–270, pl. 1*).—Low temperatures favored the preemergence phase of the disease and produced no damping-off, medium temperatures no damping-off and great reduction of the preemergence phase, and high temperatures a minimum of the preemergence phase favoring damping-off. The two varieties used (Tipperary and Ideal) proved equally susceptible to *Pythium* infection.

The results led to the recommendation that seed be germinated at high temperatures until emergence of the seedling, and then that it be lowered to produce a sturdy seedling unlikely to be subject to damping-off. Seed disinfection prior to sowing (using an organic mercury compound) gave no appreciable control.

Relationship of climatological conditions to the tobacco downy mildew, L. F. Dixon, R. A. McLean, and F. A. Wolf (*Phytopathology, 26 (1936), No. 8,*

pp. 735–759, figs. 5).—The weather in North Carolina for each year (1931–35) is presented by months as a background for elucidating the difference in time of occurrence and course of downy mildew.

Primary outbreaks did not occur on corresponding dates, but came during or immediately after periods of warm weather (1) when the minimum temperature of the surface soil had been at or above 50° F. for several days and (2) when the seedlings were sufficiently large for their lower leaves to contact the soil. Attacks occurred irrespective of the character of the sky or rainfall. Secondary infection may occur during any general type of weather prevalent at this season, since dew accumulates each night. Secondary outbreaks occurred about 2 weeks after primary attack and were partially conditioned by the effects of the weather on sporulation and dissemination.

Sporulation was favored by long periods of saturation with overcast sky. Abundant sporulation occurred only from 42° to 63° and was most abundant at 56°. Few, if any, sporangia were formed above 68° or below 36°. Maximum temperature above 90°, with intense sunshine, inhibited abundant sporulation even under favorable night conditions. Windy weather (clear or cloudy) favored dissemination of the sporangia, the greatest amount of inoculum being disseminated when it occurred during or immediately after abundant sporulation. The general outbreak in any locality occurred about 3 weeks after the primary outbreak. The primary period of dissemination lasted about 2 weeks and the secondary one about 1 week.

Weather conditions were not of primary importance in initiating recovery, which appeared to be conditioned by internal factors. Tobacco seedlings recovered most rapidly, however, during warm, clear days and warm nights.

Further studies on downy mildew of tobacco, F. A. Wolf, R. A. McLean, and L. F. Dixon (*Phytopathology, 26 (1936), No. 8, pp. 760–777, figs. 8*).—Continuing these studies (see above), certain previously reported observations on downy mildew have been confirmed, viz, relative to oospores as sources of inoculum for primary infections in the Carolinas and to seedbeds sown on the sites of old beds as infection foci. Primary outbreaks always occur in seedbeds on the sites of old beds, and secondary outbreaks are of general prevalence about 3 weeks later. The general distribution within a locality occurs through airborne sporangia. Germination of the oospores has been accomplished.

The morphological features of *Peronospora hyoscyami*, *P. nicotianae*, and *P. tabacina*, as described by various investigators, are compared and contrasted, and the tobacco pathogen in the southeastern United States is identified with the last named.

It is of primary importance as a preventive measure that seedbeds never be placed on old sites. The most important palliatives include a greater exposure of seedlings to direct sunlight than now generally employed and the judicious administration of several applications of nitrate of soda.

Serological tests with Stanley's crystalline tobacco-mosaic protein, K. S. Chester (*Phytopathology, 26 (1936), No. 8, pp. 715–734, figs. 7*).—Applying the Schultz-Dale method to materials containing several plant viruses including tobacco mosaic), it was found that the viruses tested gave no anaphylactic reactions. Healthy-plant proteins, on the contrary, were highly anaphylactogenic, and those of healthy tobacco and tomato were very similar serologically. Complement-fixation tests confirmed the anaphylactic tests in showing a cross reactivity between the crystalline and healthy-plant proteins due not to a serological affinity between virus and healthy-tobacco protein but to the presence in the crystalline material of a contaminating protein serologically allied or identical to the protein of healthy tobacco. Precipitin and complement-fixation

tests revealed the presence in the crystalline materials of considerable quantities of virus. Precipitin tests of sera from sensitized guinea pigs indicated that in a given animal tobacco-mosaic virus may be a highly active precipitinogen but inactive anaphylactically, while healthy-tobacco proteins in the same animal may be comparatively inert in producing precipitins but highly active in stimulating anaphylaxis. This implies that the mechanisms of the two reactions differ, although the same antibodies may be concerned. It is possible that the molecular size or solubility of the respective antigens underlies this difference in antigenic manifestation.

The inactivation of crystalline tobacco-mosaic virus protein, W. M. STANLEY (*Science, 83 (1936), No. 2165, pp. 626, 627*).—The crystalline protein described by the author (E. S. R., 73, p. 800; 76, p. 206) as possessing the properties of tobacco-mosaic virus was rendered incapable of reproducing the disease by treatment with H_2O_2, HCHO, $NaNO_2$, or ultraviolet light without loss of its typical serological properties and with retention of certain characteristic chemical and physical properties. The changes induced by one or more of these agents in the isoelectric point, appearance in solution, optical rotation, and amino nitrogen content are described.

Specificity of acquired immunity from tobacco-ring-spot diseases, W. C. PRICE (*Phytopathology, 26 (1936), No. 7, pp. 665–675, figs. 3*).—Valleau's yellow ring spot (E. S. R., 68, p. 208) protected tobacco plants against Wingard's ring spot No. 1 (E. S. R., 60, p. 244) and Valleau's green ring spot. Ring spot No. 1 and green ring spot gave complete protection against each other, but neither protected completely against yellow ring spot. These facts indicate that the viruses of the three diseases are closely related. Neither ring spot No. 1, green ring spot, nor yellow ring spot protected tobacco plants against tobacco mosaic, aucuba mosaic, cucumber mosaic, celery mosaic, potato vein banding, potato ring spot, spotted wilt, etch, or severe etch. Tobacco plants infected with a virus disease designated as ring spot No. 2 invariably recovered and developed a solid immunity from the disease. They did not, however, become immune from ring spot No. 1 or from any of 11 other virus diseases tested.

Ascochyta pisi viciae in seeds of vetch, W. F. CROSIER (*Assoc. Off. Seed Anal. North Amer. Proc., 27 (1935), pp. 82–86*).—As reported in this contribution by the New York State Experiment Station, fungus development in infected seeds appeared to parallel that of the seedling, and in the ungerminated seeds it was apparently present in the cotyledons. Vetch seeds of varying sources and origin were tested for infection. Preliminary experiments with moist and dry heat applied to the seeds gave encouragement for continuing a study of these methods of control.

The effect of temperatures and chemicals upon the water-melon wilt fungus, Fusarium niveum E. F. Smith, K. OHARA (*Tottori Nôgaku-Kwaihô (Trans. Tottori Soc. Agr. Sci.), 5 (1935), No. 4, pp. 245–253*).—Tests of various chemical treatments and of temperatures of from 45° to 120° C. applied for from 5 to 60 min. are reported in Japanese.

The influence of dry air on the longevity of the fire-blight pathogen, H. R. ROSEN (*Phytopathology, 26 (1936), No. 5, pp. 439–449, fig. 1*).—In these studies at the Arkansas Experiment Station, subjecting the exudate of *Erwinia amylovora* [=*Bacillus amylovorus*] to a relative humidity close to zero allowed it to remain viable and infectious for about 1 yr. Hardened exudate kept under similar conditions but exposed to laboratory air in paper packets showed no viable bacteria after a similar time, while exudate placed in corked vials suspended from a tree outdoors and exudate remaining in place on a cankered pear trunk exposed to sunlight possessed no viable, pathogenic bac-

teria after 3 mo. and 3 weeks, respectively. Tests for detecting the presence of living organisms in the soil around blighted apple and pear trees were negative.

A morphological study of viable bacteria kept under bone-dry conditions for about 1 yr. revealed no endospores, cysts, or involution forms. The Proca-Kayser method for differentiation of living from dead bacteria stained the viable cells violet or violet red and the dead ones clear red, and the dry, living bacteria were larger and more heavily and evenly stained than the dead ones.

The conclusion is reached that dry air is conducive to a relatively long life in this species, and attention is directed to an apparently common phenomenon of microscopic parasites, viz, that conditions favoring long life are often the reverse of those favoring growth and pathogenic expressions.

Relation of nitrogen-carbohydrate nutrition of Stayman apple trees to susceptibility to fire blight, G. K. K. Link and H. W. Wilcox (*Phytopathology, 26 (1936), No. 7, pp. 643–655*).—Stayman apple trees of identical past history were grown in sand culture in Chicago tanks, and a complete (plus-nitrate) nutrient solution was applied to one lot and a minus-nitrate solution to the other. Application of nitrates with particular light, temperature, and moisture conditions favored a metabolic status resulting in succulence and positive disposition to infection with *Erwinia amylovora* (=*Bacillus amylovorus*). Nonapplication of nitrates under the same conditions favored early cessation of meristematic activity, resulting in woodiness and negative disposition to infection. "Whether nonregulated enzyme systems of the host, or enzymatic and mechanical destructive forces of the parasite, or both, play the critical role in initial host injury, the metabolic and structural status of host tissue is important in conditioning phenotypic expression of genotypically determined capacity to develop susceptibility or resistance."

Overwintering of Erwinia amylovora in association with severe winter **injury on Baldwin apple trees,** E. M. Hildebrand (*Phytopathology, 26 (1936), No. 7, pp. 702–707, fig. 1*).—Studies were made at Cornell University on the survival of the fire blight organism (*E. amylovora*=*Bacillus amylovorus*) in cankers on winter-injured trees of the Bartlett pear and Baldwin apple. Injury to the pear trees was so extreme that practically all bark and wood cells were killed, resulting in death of the trees. In apples the woody cylinder was badly discolored, but the bark injury occurred chiefly just outside the canker margin where the bacteria are located. All isolations from the pear cankers were negative. Of the 345 apple cankers examined, 85 yielded *E. amylovora*, indicating that cold injury of this type favors survival. Subsequent field observations on the activity of similar cankers left on the trees substantiated these results.

Apple bitter rot control, L. Pierce (*Hoosier Hort., 18 (1936), No. 3, pp. 40, 41*).—This is a semipopular account of the disease under Indiana conditions, including control measures and lists of the most susceptible, moderately susceptible, and resistant varieties, based on 11 yr. of observations. Akin, Kinnard, and Winesap are regarded as resistant.

Variations in the chief ash constituents of apples affected with blotchy cork, W. A. DeLong (*Plant Physiol., 11 (1936), No. 2, pp. 453–456*).—The results of analyses showed a striking diminution of calcium in the fruits as the severity of attack increased. It is suggested that this low calcium content may arise as a result of competition between the leafy shoot and fruit tissues for this element during the early stages of growth. Possibly this apparent calcium deficit may play a part in the origin of the lesions typical of this trouble.

"Internal cork" of apples, Nelson, New Zealand: A study of moisture relations of soils and fruit, H. O. ASKEW, E. CHITTENDEN, and D. J. STANTON (*New Zeal. Jour. Sci. and Technol., 17 (1936), No. 4, pp. 595–599*).—Determinations of the moisture content and physical properties of soils conducted on two orchard areas failed to indicate that internal cork of Nelson apples is due to a particularly low moisture content of the soil, while determinations of the moisture content of Jonathan and Dunn Favorite apples from two orchard areas showed no positive correlation between the incidence of the trouble and a low moisture content of the fruit. Thus the study negatives a theory of water deficiency as the primary cause of "cork" ailments, but does not preclude the probability that a low moisture supply on any soil subject to cork may accentuate the trouble.

Retarded foliation in black raspberries and its relation to mosaic, L. M. COOLEY (*New York State Sta. Bul. 675 (1936), pp. 20, figs. 4*).—During late April or early May (1933–35) extensive records of field cases of retarded foliation were made in commercial plantings of black raspberries (mostly Plum Farmer and Cumberland), followed by mosaic inspection in June. An average of 85 percent of the plants found systemically infected with green mosaic in June had been recorded as exhibiting retarded foliation in April or May, while yellow mosaic cases discovered by delayed spring development gave a general average of 25 percent. In the last two seasons delayed development following winter injury simulated that due to virus infection, but careful diagnosis in 1935 reduced the error from this cause to 1.2 percent. Except following abundant winter injury, the method is recommended as a basis for a supplementary inspection and roguing in black raspberries where green mosaic control is an important factor. In red raspberries no apparent retardation by these viruses occurred.

Wild brambles in relation to spread of virus diseases in cultivated black raspberries, L. M. COOLEY (*New York State Sta. Bul. 665 (1936), pp. 15, figs. 4*).—Five yr. of field experience and study of virus disease occurrence in large experimental black raspberry plantings in the western part of the State indicated that wild red raspberries are usually infected with one or both mosaic viruses without showing marked symptoms. They also support steady populations of the principal vector (*Amphorophora rubi*) and are shown to be important in the spread of mosaics into experimental plantings. This species should be eradicated over a radius of 1,000 ft. from commercial plantings. Other wild bramble species were also prevalent but were rarely mosaic infected and were relatively unfavorable hosts for the vector.

Leaf curl occurred rarely in wild brambles. Its spead from them to experimental plantings was very slow and took place as readily from distant as from nearby sources. Its vector (*Aphis rubicola*) is common on all wild and cultivated raspberries in the area.

A few streak infections were found in wild black raspberries and blackberries, but spread to experimental plantings was apparently unimportant. The vector is unknown, but it is recommended that when black raspberry plantings contain severe streak infections any wild blackberries close by be eradicated.

Wild bramble eradication, L. M. COOLEY (*New York State Sta. Bul. 674 (1936), pp. 32, figs. 8*).—Not only are wild brambles regarded as pernicious weeds, but also as potential carriers of diseases and insect pests of cultivated raspberries and blackberries. Various common methods of eradication are reviewed. Of the chemicals tested, the effective eradicants proved to be ammonium sulfocyanate (crude liquor or crude crystalline), sodium chlorate and the proprietary chlorate mixtures Atlacide and Vegecide, and sodium arsenite. Detailed recommendations for their use as evolved from the results of plat experiments and field trials are given.

Of the several types of wild brambles, blackberries proved most resistant to chemicals. Purple or hybrid raspberries were also rather resistant, while wild red raspberries, black raspberries, and dewberries all succumbed readily to the treatments above noted. Resistance increased with vigor of growth. A fine mist spraying of the foliage was most effective. Dusting, sprinkling, and soil applications gave good results with the chlorates but not with the ammonium sulfocyanate. Brambles appeared most susceptible to the chemicals about the time of fruiting. The ammonium sulfocyanate was less effective in spring and fall and noneffectual in winter.

Chemical control of harmful fungi during stratification and germination of seeds of Ribes roezli, C. R. Quick (*Phytopathology, 26 (1936), No. 7, pp. 694–697*).—In this investigation by the U. S. D. A. Bureau of Plant Industry in cooperation with the University of California, treatment of the propagating medium of *R. roezli* seed cultures with powdered cupric oxalate (6 to 10 g of chemical per square foot of culture surface), prior to stratification and germination, greatly lessened the usual serious seedling losses from damping-off fungi. Basic copper carbonate, formaldehyde, and nitric acid were somewhat less effective.

Further observations on mold control in grapes during transit and storage—1935 season, C. E. Asbury, C. O. Bratley, and W. T. Pentzer (*Blue Anchor, 13 (1936), No. 6, pp. 8, 9, 21*).—This is a résumé of progress during the 1935–36 season in the investigation which has been in progress for several years.[1] The usual fumigation with sulfur dioxide proved beneficial to grapes in display lugs shipped to eastern markets for immediate consumption. Addition of sodium bisulfite to the pads was of no value in the experimental tests, but when it was combined with light sulfur dioxide gassing in solid carload shipments, longer life on the market was reported. Commercial application of sodium bisulfite to grapes is considered as still in the experimental stage, and the correct amounts and proper distribution in the pads or sawdust require careful supervision.

Specific effects of zinc applications on leaves and twigs of orange trees affected with mottle-leaf, H. S. Reed and E. R. Parker (*Jour. Agr. Res. [U. S.], 53 (1936), No. 5, pp. 395–398, fig. 1*).—In experiments near Riverside by the California Experiment Station, "orange trees affected with mottle-leaf produced healthy foliage and increased growth after they had been sprayed with a zinc-lime mixture. The specific effects observed were (1) larger leaves, (2) longer internodes, and (3) more xylem tissue."

Low lime bordeaux mixture, copper sulphate solution, and copper sulphate solution plus summer oil emulsion as sprays used for the control of pecan scab, J. R. Cole and J. R. Large (*Southeast. Pecan Growers Assoc. Proc., 30 (1936), pp. 10, 11, 13–18*).—Because of the early infection and the danger from bordeaux-drought injury, changes in the spray program were indicated. In tests in 1935, from one to two prepollination sprays of a weak and low-lime bordeaux mixture (2–0.5–50), followed by the usual number of cover sprays as the regular schedule but using either a 2–0.5–50 or a 3–1–50 mixture or a copper sulfate solution containing 1 lb. of $CuSO_4$ to 50 gal. of water plus 1 qt. of summer oil emulsion, gave good control.

Contributions from the Wisley Laboratory.—LXXVI, The ink disease (or bulb scab) of Iris reticulata caused by Mystrosporium adustum Massee., D. E. Green (*Jour. Roy. Hort. Soc., 61 (1936), No. 4, pp. 167–175, pls. 5, fig. 1*).—The experiments here reported confirm previous experience in the open garden as indicating that batches of *I. reticulata* bulbs showing inky markings

[1] Blue Anchor, 11 (1934), No. 8, pp. 2–4, 23, figs. 3; 12 (1935), No. 5, pp. 6, 26, 27.

when planted slowly decrease in number. During the growing season the foliage of diseased plants if given a slight pull came up, showing a rotten base. Bulbs injured by *M. adustum* were more quickly rotted by secondary decay organisms in unsterilized than in sterilized soils. It is believed that the safest method for control lies in the removal of any outer scales showing black patches and in the destruction of bulbs with black areas on the inner, fleshy portion. Other methods are briefly discussed.

A preliminary statement of the effects of presoaking narcissus bulbs before treatment with hot water and fungicides, G. L. Stout and C. V. Dick (*Calif. Dept. Agr. Bul., 25 (1936), No. 2, pp. 270–272*).—Presoaking of bulbs before the hot water or fungicide treatments for nematodes, in general, slightly delayed the blooming period (but with a slight advance when Ceresan followed the hot water), injured the flowers in proportion to the length of time applied (presoaking for from 13 to 24 hr. causing injury enough to be important for flower production), but gave no consistent detrimental effects on bulb production.

Differentiation of two mosaic diseases of Petunia by means of serological, cytological, and inoculation experiments [trans. title], T. Matsumoto (*Bot. and Zool. [Tokyo], 3 (1935), No. 5, pp. 893–898, figs. 3*).—The author concluded from this study that there are two types of mosaic in *Petunia*, which he designates as "A" and "B." The symptoms appear similar, but inoculations of the B form to healthy *Petunia* plants resulted in visible flecks on the new leaves within from 7 to 10 days, whereas the A form could not be carried either to *Petunia* or tobacco by artificial means, nor was it transmissible by the seed (i. e., no visible symptoms appeared). Insect transmission tests also gave negative results. It is thus still in doubt whether or not the A form is an infective type.

The text is in Japanese.

Fasciation of sweet peas caused by Phytomonas fascians n. sp., P. E. Tilford (*Jour. Agr. Res. [U. S.], 53 (1936), No. 5, pp. 383–394, figs. 2*).—In this contribution from the Ohio Experiment Station, *P. fascians* n. sp. is described and shown to be the cause of fasciation in winter-flowering sweet peas in Ohio. Experimentally, it induced fleshy, fasciated shoots in garden peas, petunias, geraniums, tobacco, *Gypsophila paniculata*, and in 10 varieties of sweet peas. The organism was also isolated from fasciated growths in chrysanthemum.

Ten years' experience in induced immunity to chestnut blight and other plant diseases, G. A. Zimmerman (*Penn. Nut Growers Assoc. Rpt. Proc., 4 (1936), pp. 21–23*).—This is a general summary of the author's endeavors to build up an acquired immunity to *Endothia parasitica* in chestnut trees by injections, for which tangible results are claimed. Brief notes are also included on similar attempts with respect to cherry aphids, black knot of plum, blackberry rust, and with a serum from papaw seed.

A seedling wilt of black locust caused by Phytophthora parasitica, E. B. Lambert and B. S. Crandall (*Jour. Agr. Res. [U. S.], 53 (1936), No. 6, pp. 467–476, figs. 3*).—This previously unreported disease was found (1933–35) in four nurseries in Virginia, North Carolina, and Alabama. In some cases destructive epidemics developed in seedlings from 1 to 3 weeks old, but older seedlings usually recovered. The disease was induced among healthy seedlings in the greenhouse by spraying them with swarm spores and by infesting the soil with culture material.

In regions where the disease is likely to occur, well-drained sites with a soil acidity of about pH 5 are advised for sowing black locust. Control can

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be obtained by acidifying the soil with aluminum sulfate or by a bordeaux spray program.

Some applied biological aspects of problems relating to plant-parasitic nematodes, T. GOODEY (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 203–230*).—This article includes a general review of the plant nematode situation from a world-wide viewpoint, with special reference to the results of research and to the practical problems of control. More than 50 references are listed.

Feeding habits of the nematodes Aphelenchoides parietinus and Aphelenchus avenae, J. R. CHRISTIE and C. H. ARNDT (*Phytopathology, 26 (1936), No. 7, pp. 698–701, fig. 1*).—In this study by the U. S. D. A. Bureau of Plant Industry and the South Carolina Experiment Station, these nematodes were reared on agar plates only when a fungus was present. They fed by inserting the stylet and removing the hyphal contents. Both species frequently invaded lesions on the hypocotyls of cotton seedlings and occasionally penetrated healthy cortical tissues. Apparently *Aphelenchoides parietinus* may also feed on epidermal root cells, and in one instance it had infested the terminal buds of cotton seedlings, resulting in "blind" plants or distorted leaves.

The action of certain halogen compounds on the potato eelworm, Heterodera schachtii, E. M. SMEDLEY (*Jour. Helminthol., 14 (1936), No. 1, pp. 11–20*).—Through their action on proteins hypochlorite solutions can dissolve the cysts of *H. schachtii*, as well as other forms of nematode cuticle, but solutions too dilute to dissolve the cysts stimulate the larvae to hatch at enormously increased rates. Such solutions containing calcium can attack the egg membrane so that the larvae are induced to hatch without any of the natural stimulants, such as root excretions, and can, therefore, be used to cause hatching in the absence of suitable hosts, thus reducing infection.

The ability of hypochlorites to stimulate the hatching of this nematode is considered as not merely a function of their action as alkalies and oxidating agents but as due largely to their peculiar action on proteins.

A new eelworm disease of the tomato, P. H. WILLIAMS (*Gard. Chron., 3. ser., 99 (1936), No. 2577, p. 316, fig. 1*).—This is apparently the first report of *Anguillulina dipsaci* on tomato stems and leafstalks, where it caused extensive spongy swellings.

Hot-water treatment in the control of root knot nematodes in tuberous plants [trans. title], GOFFART (*Blumen u. Pflanzenbau ver. Gartenwelt, 40 (1936), No. 10, pp. 111, 112*).—From his experience in the control of *Heterodera marioni* in tuberous plants in greenhouses, the author advocates treatment of the resting tubers for from 20 to 30 min. in a water bath at from 45° to 50° C.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife restoration and conservation: Proceedings of the North American Wildlife Conference called by President Franklin D. Roosevelt (*Washington: Govt., 1936, pp. XII+675, figs. 3; abs. in U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. No. 6 (1936), pp. 29*).—This conference was held at Washington, D. C., from February 3 to 7, 1936. The general sessions were opened by H. A. Wallace, Secretary of Agriculture, who read a statement from President F. D. Roosevelt and later addressed the conference (pp. 109–114). Among other participants were J. Zinser on The Mexican Wildlife Situation (pp. 6–11), H. Lloyd on The Administration of the Wildlife of Canada (pp. 11–15), J. N. Darling on The Crisis (pp. 16–24), F. A. Silcox on Wildlife Management on the National Forests (pp. 255–259), and P. S. Lovejoy on Harmonizing Conflicting Interests in Land Management (pp. 260–267).

Sectional meetings the proceedings of which are reported dealt with farmer-sportsman cooperatives (pp. 275–296); fish management (pp. 297–342); upland wildlife research (pp. 343–370); game breeding (pp. 371–395); forests and forest wildlife (pp. 396–427); stream and lake improvement (pp. 428–468); wildlife disease and population cycles research (pp. 469–493); research in waterfowl problems (pp. 494–530); pollution (pp. 531–575); practical wildlife management (pp. 576–618); fur resources (pp. 619–638); and the problem of vanishing species (pp. 639–666). An author and subject index is included.

In the section of upland wildlife research the contributions presented were The Reproduction Function in the Cottontail Rabbit (*Sylvilagus floridanus mearnsii* Allen) in Southern Michigan, by R. E. Trippensee (pp. 344–350); Management of Wild Turkey, by H. L. Stoddard (pp. 352–356); Differences in Nutritive Values of Winter Game Foods, by P. L. Errington (pp. 356–360), contributed from the Iowa Experiment Station; A Report on the Pillsbury, New Hampshire, Game Management Project, by J. P. Miller (pp. 360–365); and Pennsylvania's Field Game Investigations, by R. Gerstell (pp. 365–370).

In the section on game breeding the contributions presented were Seminatural Game Farms for Wild Waterfowl, by W. Grange (pp. 371–373); Modern Methods of Quail Breeding, by M. O. Poyner (pp. 373–376); Pennsylvania System of Artificial Brooding of Ring-Necked Pheasants, by E. C. Smith (pp. 376–378); Game Bird Standards of Perfection, by M. D. Pirnie (pp. 378–380); Sanitation on the Game Farm, by S. M. Costigan (pp. 380–384); Releasing Larger Pheasants, by C. W. Wessell (pp. 384, 385); and The Legal Status of the Hand-Reared Pheasant, by O. Beyer (pp. 386–393). In the section on research in waterfowl problems the contributions presented were Duck Nesting Carrying Capacities in Iowa, by L. J. Bennett (pp. 494–498); Eelgrass and Other Waterfowl Foods—Present Status and Future Prospects, by H. F. Lewis and C. Cottam (pp. 498–501); Michigan Waterfowl Management Studies, by M. D. Pirnie (pp. 501–504); Mosquito Control and Waterfowl, by W. S. Bourn (pp. 505–508); Waterfowl Populations, by F. C. Lincoln (pp. 509–516); Waterfowl Conditions in Canada, 1935, by H. Lloyd (pp. 516–518); The Wild-Duck Factory Needs Repairs, by J. C. Huntington (pp. 518–523); The Fundamentals of the Duck Situation, 1936, by P. A. Taverner (pp. 523–525); and Wild Waterfowl Conditions in Manitoba, by A. G. Cunningham (pp. 525, 526).

Wildlife Review [September 1935–November 1936] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. Nos. 1 (1935), pp. 32; 2 (1936), pp. 31; 3, pp. 36; 4, pp. 35; 5, pp. 34; 6, pp. 29*).—Abstracts of the literature relating to wildlife management intended for the benefit of employees and cooperators of the Bureau of Biological Survey are presented in this serial conducted by W. L. McAtee. Notes and news items are included. No. 6 is devoted entirely to abstracts of papers from the North American Wildlife Conference above noted.

[Contributions on wildlife research] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Res. and Mangt. Leaflets BS–25 (1935), pp. 4; BS–26, pp. 2; BS–27 (1936), pp. 4, pl. 1; BS–28 (1935), p. 1; BS–29, pp. 5, figs. 3; BS–30 [1936], pp. 13, fig. 1; BS–31 (1936), pp. 3, pls. 2; BS–32, pp. 2; BS–33, pp. 4; BS–34, pp. 2; BS–35, pp. 2; BS–36, pp. 2; BS–36, rev., pp. 4; BS–37, pp. 8; BS–38, pp. 16; BS–39, pp. 6; BS–40, pp. 2, pl. 1; BS–41, pp. 14, fig. 1; BS–42, pp. 12, fig. 1; BS–43, pp. 13, fig. 1; BS–44, pp. 26, fig. 1; BS–45, pp. 14, fig. 1; BS–46, pp. 9, fig. 1; BS–47, pp. 10, fig. 1; BS–48, pp. 12, fig. 1; BS–49, pp. 12, fig. 1; BS–50, pp. 13, figs. 2; BS–51, pp. 8, figs. 2; BS–52, pp. 2; BS–53, pp. 5; BS–54, pp. 5; BS–55, p. 1; BS–56, p. 1; BS–57, pp. 3, fig. 1; BS–58, pp. 12, figs. 4; BS–59, pp. 2, fig. 1; BS–60, pp. 4, fig. 1; BS–61, pp. 5, figs. 6; BS–62, pp. 6; BS–63, pp. 2; BS–64, pp. 10, figs. 2; BS–65, pp. 5, fig. 1; BS–66, pp. 4; BS–67, pp. 5; BS–68,*

pp. 32; BS–69, pp. 4).—This series of contributions (E. S. R., 74, p. 511) is continued as follows: Fur Resources—the Stepchild of Conservation, by F. G. Ashbrook (BS–25); Directions for Poisoning Pinon Jays (BS–26); A Cage Trap Useful in the Control of White-Necked Ravens [*Corvus cryptoleucus*], by S. E. Aldous (BS–27); Feeding Schedule for Rabbits (BS–28); Directions for Preservation and Care of Material Collected for Food Habits Studies (BS–29); Economic Ornithology and the Correlation of Laboratory and Field Methods, by C. Cottam (BS–30); Average Weight of Rabbits at Weaning Age, by C. E. Kellogg (BS–31); Raising Badgers in Captivity (BS–32); Forestry and Game Management, by H. H. Chapman (BS–33); Raising Raccoons (BS–34); Raising Muskrats (BS–35); Publications on Fur and Fur Animals (BS–36 and BS–36 rev.); The Correlation of Forestry and Wildlife Management, by I. N. Gabrielson (BS–37); Cooperative Research in Wildlife Management—a Summary of the Project to February 15, 1936, by I. T. Bode (BS–38); Report on the Arnett, Oklahoma, Experimental Quail and Prairie Chicken Management Project, by V. Davison, abridged by W. L. McAtee (BS–39); An Automatic Drinking Fountain for Minks, by C. F. Bassett (BS–40); Fruits Attractive to Birds—Northwestern States, Region No. 1 (BS–41), Rocky Mountain States, Region No. 2 (BS–42), Northern Plains States, Region No. 3 (BS–43), Northeastern States, Region No. 4 (BS–44), California, Region No. 5 (BS–45), Great Basin States, Region No. 6 (BS–46), Southwestern States, Region No. 7 (BS–47), Southern Plains States, Region No. 8 (BS–48), Southeastern States, Region No. 9 (BS–49), and Florida, Region No. 10 (BS–50), all by W. L. McAtee; Local Control of Magpies, by E. R. Kalmbach (BS–51); Raising Guinea Pigs (BS–52); Birdbanding (BS–53); Rodent Control Aided by Emergency Conservation Work, by S. P. Young (BS–54); Pertinent Facts on the Angora Wool Rabbit (BS–55); Periodicals on Rabbits and Cavies (BS–56); Marking Wild Animals for Identification, by F. G. Ashbrook (BS–57); Classification and Price Trends of Silver Fox Skins, by C. E. Kellogg (BS–58); Directions for Organizing and Conducting Rabbit Drives (BS–59); Feeding the Weaned Minks, by C. F. Bassett (BS–60); Sullys Hill National Game Preserve, North Dakota, compiled by C. Ruth (BS–61); Suggestions on Trapping Coyotes and Wolves in Alaska, by H. H. Gubser (BS–62); Raising Martens in Captivity (BS–63); Protecting Crops From Damage by Horned Larks in California, by J. A. Neff (BS–64); Relative Weights of Young Rabbits and Does During the Suckling Period (BS–65) and Polygamous Mating of Foxes (BS–66), both by C. E. Kellogg; Wildlife Technology, by W. L. McAtee (BS–67); Abstract of Fur Laws, 1936–37, compiled by F. G. Grimes (BS–68) (E. S. R., 74, p. 511); and Fur Farming in Perspective, by F. G. Ashbrook (BS–69).

Officials and organizations concerned with wildlife protection, 1936, compiled by F. G. Grimes (*U. S. Dept. Agr., Misc. Pub. 244* (*1936*), *pp. 16*).—This is the thirty-sixth annual directory of officials and organizations concerned with wildlife protection and conservation (E. S. R., 74, p. 364).

Game laws for the season 1936–37: A summary of Federal, State, and Provincial statutes, H. P. Sheldon and F. G. Grimes (*U. S. Dept. Agr., Farmers' Bul. 1766* (*1936*), *pp. II+38*).—This is the thirty-seventh annual summary of the Federal and other game laws and regulations (E. S. R., 74, p. 364).

Procedure in taxonomy, E. T. Schenk and J. H. McMasters (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, 1936, pp. VII+72*).—Following an introduction, the several chapters of this work deal with systematic categories, types, the description of a new species, specific names, synonymy, storage of type material, and Latin terms and abbreviations.

The international rules of zoological nomenclature and summaries of opinion rendered are presented in an appendix, and a general index, with an index to the international rules and to opinions rendered, is included.

The mammals and life zones of Oregon, V. Bailey (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 55 (1936), pp. 416, pls. 52, figs. 102*).—Following an introduction in which the present study and the physiographic features of Oregon are considered, the life zones of the State (as shown by an attached map) are dealt with (pp. 11–53). A discussion of the mammals of Oregon as an important natural resource is followed by an annotated list of the species, including the type locality, general characters, measurements, distribution and habitat, habits, and economic status of each so far as known. A bibliography of seven pages, a glossary of Indian names of mammals, and an index of the subject matter are included.

Birds of the West Indies, J. Bond (*Philadelphia: Acad. Nat. Sci., 1936, pp. XXIV+456, [pls. 2, figs. 156]*).—An account with full descriptions of all the birds known to occur or to have occurred on the West Indian islands, presented in 19 chapters and including introduced species, a systematic list of West Indian birds, and indexes to the common and local names.

The birds of the Malay Peninsula: A general account of the birds inhabiting the region from the Isthmus of Kra to Singapore with the adjacent islands.—III, Sporting birds, birds of the shore and estuaries, H. C. Robinson and F. N. Chasen (*London: H. F. & G. Witherby, 1936, vol. 3, pp. XXI+264, pls. [26]*).—This third volume of the work previously noted (E. S. R., 60, p. 59) is illustrated with 25 full-page plates in color.

Catbirds and moths, R. Latham (*Oölogist, 53 (1936), No. 6, pp. 69–72*).—Observations of the food habits of catbirds are noted. They are said to feed on any species of moth, large or small, and beetles, being particularly fond of June beetles and carabids, especially *Harpalus pennsylvanicus*, and to take practically all other orders of insects attracted to light in the vicinity of Orient, Long Island, N. Y. Reference is made to their consumption of a large swarm of the eastern tent caterpillar moths.

Excluding birds from reservoirs and fishponds, W. L. McAtee and S. E. Piper (*U. S. Dept. Agr. Leaflet 120 (1936), pp. II+6, figs. 3*).—Means for preventing birds from contaminating potable water and from making destructive forays among fishes in hatchery and rearing ponds are considered in this account. It has been demonstrated that water reservoirs not more than 1,000 ft. in their longest dimension can be satisfactorily and economically protected by wiring, as can small pools by screening. The suggestions presented are recommended chiefly as the result of observations on their effectiveness in actual practice.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 1022–1028*).—The notes here presented (E. S. R., 76, p. 64) relate, respectively, to The Fluorine Compounds as Insecticides—A Monograph With Annotated Bibliography, by R. H. Carter (pp. 1022, 1023); *Coccidophilus citricola* Brèthes, a Predator Enemy of [California] Red and Purple Scales (pp. 1023, 1024) and Japanese Species of *Tetrastichus* Parasitic on Eggs of *Galerucella xanthomelaena* (Schrank) (pp. 1024, 1025), both by S. E. Flanders; *Geocoris punctipes* Say Observed as Predaceous Upon Eggs of *Phlegethontius* sp., by J. U. Gilmore (p. 1025); A Food for Rearing Laboratory Insects, by M. H. Haydak (p. 1026); Long Survival of *Gibbium psylloides* Czemp., by C. Lyle (p. 1026); A Crane Fly Larva [*Nephrotoma ferruginea* Fab.] Attacking Newly Set Strawberry Plants, by W. A. Thomas (pp. 1026, 1027); Injury to Lumber by *Hadrobregmus carinatus* Say, by N. M. Payne (p. 1027); Potential New Insecticides, by L. E. Smith, E. H. Siegler, and F. Munger (p. 1027); Wider Uses for

Nicotine, by P. O. Ritcher and R. K. Calfee (pp. 1027, 1028), contributed from the Kentucky Experiment Station; and Observations on Control of Mexican Bean Beetle in Association With Powdery Mildew Disease on Snap Beans, by L. W. Brannon and N. F. Howard (p. 1028).

[Contributions on extension entomology] (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 904–923, figs. 3*).—The following contributions on extension entomology (E. S. R., 76, p. 64) are presented: Fighting Mormon Crickets (*Anabrus simplex* Hald.) (Orthoptera, Tettigoniidae), by C. Wakeland (pp. 904–908); Organization of the Kansas Entomology Extension Service, by E. G. Kelly (pp. 908–911); Some Thoughts on Teaching Entomology to Adults, by A. B. Graham (pp. 911–913); Chalk Talks in Extension Entomology, by R. R. Reppert (pp. 913–916); Cricket [Mormon and Coulee Crickets] Control in Washington, by I. W. Bales (pp. 916–918); Effective Grasshopper Control by Farm Operators, by F. D. Butcher (pp. 918–921); and The Extension Service and Insect Control, by M. P. Jones (pp. 921–923).

[Insect population studies] (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 433–444, fig. 1*).—The two contributions on this subject are (1) Insect Fluctuations: Population Studies in the Gall Midges (Cecidomyidae), by H. F. Barnes (pp. 433–440), contributed from the Rothamsted Experimental Station, and Fluctuations of Insect Populations: Field Observations, by A. Roebuck (pp. 441–444).

[Work in entomology by the Georgia Station] (*Georgia Sta. Rpt. 1936, pp. 26–31, figs. 3*).—The work of the year (E. S. R., 74, p. 366) with the flat-headed borers in pecan and the pecan weevil, conducted cooperatively with the U. S. D. A. Bureau of Entomology and Plant Quarantine; the southern corn rootworm; the cowpea curculio; the fall armyworm on corn; bollweevil parasites, conducted in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine; the vegetable weevil; and peach infestation by curculio is reported upon, together with notes on the occurrence of several other species.

Entomological notes.—I, II, Some common insect pests of fruit trees (*Trop. Agr. [Ceylon], 86 (1936), Nos. 4, pp. 195–205; 5, pp. 259–270*).—A report on some insect pests of citrus, mango, and miscellaneous fruit trees in Ceylon.

Heat and cold resistance of the grain weevils and the grain mites in relation to the temperature of their development, N. P. Smaragdova (Smaragdowa) (*Zool. Zhur. (Rev. Zool. Russe), 14 (1935), No. 4, pp. 737–748, figs. 6; Eng. abs., pp. 747, 748*).—In a study of heat and cold resistance, it was found that the mites *Caloglyphus rodionovi* A. Z. and *Aleuroglyphus ovatus* Tr. when bred at 30° C. are more resistant to heat as well as a very low temperature than those taken from a culture bred at 20°. Humidity has a great influence on heat resistance and dry air reduces it. *A. ovatus* is more resistant to low and to high temperatures in comparison with *C. rodionovi*. Rice weevils developed at a high temperature present a greater resistance than those developed at a low temperature, but this was not the case with the granary weevil, which is much more resistant to heat than the rice weevil.

Insect fauna of cured tobacco in storage in the United States, E. M. Livingstone and W. D. Reed (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 1017–1022*).—In this discussion the fauna of cured tobacco is divided into two groups, the first of which includes all of the species that feed on tobacco, including their parasites and predators, and the second the species that temporarily inhabit tobacco.

Forest insects, R. W. Doane, E. C. Van Dyke, W. J. Chamberlin, and H. E. Burke (*New York and London: McGraw-Hill Book Co., 1936, pp. XII+463, [pl. 1], figs. 234*).—The chapters of this work are devoted to the importance of forest entomology; the control of forest insects and insects injurious to forest products; beetles; moths and butterflies; sawflies, horntails, bees, and ants;

aphids, scale insects, and others; other orders of insects and the mites; and termites or white ants. Lists of the more important coniferous and hardwood trees of the United States and some of their principal insect enemies are appended.

Biological methods and their use in forest entomology, I. TRÄGÅRDH (*Svenska Skogsvårdsför. Tidskr., 34 (1936), No. 2, pp. 426–441, figs. 8; Eng. abs., pp. 476–479*).—A general discussion of biological methods in the control of forest insects.

Blood albumin spreader used with oil sprays, R. H. SMITH and J. P. LADUE (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 838–842*).—Investigations at the California Citrus Experiment Station, made with a view to securing data on the range in quality of the albumin and of the spreader as produced by different manufacturers, the effect of different types of earths on the keeping and performance qualities of the spreader, and a method for determining the solubility of the spreader, are reported upon.

Effect on chickens of arsenic in grasshopper bait: Little danger in eating arsenic-fed chickens, H. F. WILSON and C. E. HOLMES (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 1008–1014*).—Experiments conducted by the Wisconsin Experiment Station during the grasshopper control campaign in 1934 are reported upon.

Under cage conditions chickens did not feed on poisoned grasshopper bait made according to the Wisconsin formula, and in picking corn out of poisoned sawdust did not pick up enough of the scattered bait to produce any serious cases of poisoning. There appears to be little or no danger of poisoning chickens when they have access to poison bait containing a mixture of bran, sawdust, and whey, used as a carrying agent for arsenic trioxide. Reasonable care in keeping chickens away from poisoned grasshopper bait made with arsenic trioxide will prevent losses by poisoning.

Comparative methods of removing lead loads resulting from a heavy first-brood oil-lead schedule, C. L. BURKHOLDER and O. W. FORD (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 827–830*).—Studies at the Indiana Experiment Station in 1935 of the comparative efficiency of washing equipment in the removal of lead arsenate from sprayed fruit and the factors involved are reported upon, the details being given in two tables.

Cracca—a source of insecticides.—A preliminary study of domestic species of devil's shoestring as sources of insecticidal materials, H. A. JONES, F. L. CAMPBELL, and W. N. SULLIVAN (*Soap, 11 (1935), No. 9, pp. 99, 101, 103, 105, 107, 109, figs. 2*).—In the course of the studies here reported, the details of which are given in tables, "chemical and insecticidal tests were made on 32 samples of *Cracca* collected in different parts of the United States. Twenty-seven of these samples were roots: 19 of *C. virginiana*, 3 of *C. lindheimeri*, 2 of *C. ambigua*, and 1 each of *C. latidens*, *C. hispidula*, and *C. spicata*. The other samples consisted of aerial portions, hulls of seed pods, and seed of *C. lindheimeri* and mixed seeds and pods of *C. virginiana* and *C. ambigua*. Ten States, from Texas to Maryland, were represented in the collections. The following determinations were made on all or some of the 32 samples: Total acetone, extractives, rotenone content, methoxyl content, optical rotatory power of acetone extract, and Durham color test. The relative effectiveness of kerosene and acetone extracts was determined against houseflies, the acetone extracts being tested by a method not hitherto described.

"The relative effectiveness of the kerosene extracts was similar to that of the acetone extracts, and the latter was well correlated with the degree of blue or blue-green color given by the Durham test. By this simple test the

effectiveness of a sample of *Cracca* can be roughly predicted. The insecticidal results were not well correlated with other chemical determinations. As only a few samples contained enough rotenone to permit its quantitative determination, data sufficient for comparison of rotenone content and effectiveness were not obtained. Four samples of *C. virginiana* root from Texas and one of *C. latidens* from Florida contained from 0.2 to 0.5 percent of rotenone.

"The most effective samples of *C. virginiana* root came from Texas. Samples from the Carolinas, Virginia, and Maryland were relatively ineffective. A sample of *C. latidens* root from Florida, one of *C. lindheimeri* root from Texas, and seeds of the latter species were also highly effective.

"In spite of its lower content of toxic materials, it is believed that *Cracca* might be developed to an extent permitting competition with derris and cube."

The insecticidal properties of some east African plants.—II, Mundulea suberosa Benth., R. R. le G. Worsley (*Ann. Appl. Biol.*, *23* (*1936*), *No. 2*, *pp. 311–328*, *figs. 6*).—In continuation of previous studies (E. S. R., 73, p. 208), the author has found the bark of *Mundulea* from Moa district, Tanganyika, to be as toxic to insects as Amani derris root containing 5.4 percent rotenone. That obtained from two other districts is only about half as toxic. The former tree may be a variety of the ordinary *M. suberosa*.

"The powder dusted on cockroaches and flies, although having a much smaller initial effect than pyrethrum and not producing any rapid knock-down, yet causes death in about half the time; derris has the same action. The same remarks apply to paraffin extracts of these substances. *Mundulea* seeds are about three-quarters as toxic as the bark, but are unlikely to be of any commercial value on account of their scarcity."

The experimental cultivation of this plant is under way with a view to commercial use of the bark.

Decrease in effectiveness of stored pyrethrum dusts as shown by biological tests with the celery leaf tier in the laboratory, C. B. Wisecup (*Jour. Econ. Ent.*, *29* (*1936*), *No. 5*, *pp. 1000–1003*).—Laboratory biological tests made with stored pyrethrum dusts for control of the greenhouse leaf tier indicated that "undiluted pyrethrum would be effective in the field when stored for as long as 3 yr. in closed containers. The commonly used pyrethrum-tobacco mixture should be effective when stored for 1 or 2 yr. in closed containers, but a definite deterioration could be expected when stored in open containers, as is a common practice among farmers in the Sanford, Fla., area."

Toxic action of nicotines, nornicotines, and anabasine upon Aphis rumicis L., C. H. Richardson, L. C. Craig, and T. R. Hansberry (*Jour. Econ. Ent.*, *29* (*1936*), *No. 5*, *pp. 850–855*, *figs. 5*).—In work conducted at the Iowa Experiment Station "*dl*-β-nornicotine, *dl*-α-nicotine, *dl*-α-nornicotine, *dl*-β-nicotine (racemic nicotine), and anabasine (*l*-β-pyridyl-α-piperidine) were compared in toxicity with *l*-β-nicotine (natural nicotine). The solution of the bases in 0.25 percent sodium oleate solution were applied in a fine spray to adult *A. rumicis* under standardized conditions. The order of toxicity, based upon the median lethal concentrations in milligrams per cubic centimeter of solution, is: Anabasine>*l*-β-nicotine=*dl*-β-nornicotine>*dl*-β-nicotine>*dl*-α-nicotine=*dl*-α-nornicotine. The presence or absence of a CH_3 group on the pyrrolidine nitrogen of a pyridyl pyrrolidine is not essential for the toxic action of the compound to *A. rumicis*. This may or may not be true for certain vertebrate animals and by inference for other insects. The compounds with linkage at the β-position of the pyridine nucleus are the most toxic in this series as they have previously been found to be in the pyridyl piperidine series. This relation between β-position and toxicity in these pyridine derivations may prove to be fairly general, for it seems to hold true for

certain vertebrates as well as for aphids. Racemic nicotine is about one-half as toxic as natural nicotine, the laevo fraction probably being largely responsible for its action on this aphid. Anabasine is considerably more toxic than the other compounds studied in this investigation, and it is probably somewhat more toxic than neonicotine."

Arsenical substitutes.—II, Some relationship between molecular structure and toxicity of organic compounds to the silkworm (Bombyx mori), J. M. GINSBURG and C. J. CAVALLITO (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 856–859*).—In this second contribution from the New Jersey Experiment Stations (E. S. R., 73, p. 346), "the insecticidal properties of 121 water-insoluble organic compounds were tested as stomach poisons against silk moth larvae. Only 28 chemicals possessed any toxicity whatsoever, while 7 chemicals produced mortality of from 55 to 100 percent after 3 days. The results suggest that organic compounds are apt to be of higher toxicity to chewing insects when they contain both amino and thio groups in the molecule."

The effect of a few toxic substances upon the total blood cell count in the cockroach Blatta orientalis Linn., R. A. FISHER (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 335–340*).—In a study at the Idaho Experiment Station it was found that the death of the oriental cockroach due to white arsenic, mercuric chloride, and sodium fluosilicate caused, respectively, significant decreases from the acetic acid average of 36,173 to 8,179, 7,083, and 6,778 cells per cubic millimeter of blood. "This decrease is caused apparently by the disappearance of the type of cell having a small nucleus and a large amount of cytoplasm. Normally these cells are present in large numbers. Carbon disulfide has no apparent effect upon the blood cells. Hydrocyanic acid and ether show no difference from acetic acid in their effect upon the blood cell count, probably because of some interference with normal coagulation. Pyridine causes a significant increase in the blood cell count. This increase cannot yet be considered real because of the limited number of cockroaches in the sample."

Inhibition of coagulation in the blood of insects by the fatty acid vapor treatment, W. E. SHULL (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 341–349, fig. 1*).—The author has found in studies at the Idaho Experiment Station that coagulation in the blood of the oriental cockroach is inhibited by treating the insect with the vapors of formic, acetic, propionic, butyric, and valeric acids. "The length of time of treatment necesssary to cause inhibition of coagulation in the blood of insects varies inversely with the temperature of the treatment and directly with the physical properties of the acid. Inhibition of coagulation is complete only when the insects succumb to the treatment, but may be retarded without killing the insects when the time of treatment in the acid vapor is decreased. Of the organic and inorganic compounds reported in this and previous papers [E. S. R., 68, p. 354; 70, p. 500], only the fatty acids inhibit coagulation in the blood of the cockroach, which seems to indicate that the carboxyl radical common to these acids is responsible for the inhibitory properties of the acids."

Insect parasitism and biological control, C. P. CLAUSEN (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 201–223, figs. 6*).—This discussion, accompanied by charts graphically illustrating the subject, was presented as an address at the annual meeting of the Entomological Society of America in December 1935.

Thysanoptera of the geenton, J. R. WATSON (*Fla. Ent., 18 (1934), No. 3, pp. 44–46; 18 (1935), No. 4, pp. 55–62*).—This contribution from the Florida Experiment Station reports observations of thrips found in materials on the surface of the soil, including molding and rotting leaves and wood and dead and decaying grass, and also materials such as bark and woody fungi, lichens,

epiphytes, and ferns growing on limbs of trees. Several species are described as new.

Grasshoppers and agricultural development in North Dakota, J. A. MUNRO (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 813–820*).—This contribution from the North Dakota Experiment Station presents a brief historical account and then deals briefly with heavy migratory flights, outbreaks during the present century, surveys and control activities, effectiveness of the 1934 campaign, species involved, flight dispersal an important control factor, and land utilization and grasshopper abundance.

The biology of Leptobyrsa rhododendri Horvath (Hemiptera, Tingitidae), the rhododendron lacebug.—I, Introduction, bionomics, and life history, C. G. JOHNSON (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 342–368, pls. 3, figs. 4*).—Following an introductory account of the rhododendron lacebug and references to the literature, of which a list of 63 is given, its distribution in Great Britain, morphology, and bionomics are taken up.

Chinch bug flights, W. T. EMERY (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 833–837, figs. 2*).—The data obtained from flight screens in connection with sod and air temperatures, made by thermocouple bulb and thermograph, respectively, have shown that when chinch bugs migrate from winter quarters their flights are governed largely by changes in temperature. "Flights from places of hibernation occur in spring when the temperature of the sod in which the bugs are hibernating reaches 60° F. Redistribution flights occur late in the spring and during the summer when air temperatures fall below 60° and then rise distinctly above that temperature. Flights to places of hibernation occur in the fall after drops in temperature corresponding to the temperature increases observed in the spring. In spring, migrating chinch bugs stop at the margins of grainfields, or as soon as they have reached an attractive food supply."

Observations on the life history and control of the cabbage aphis (Brevicoryne brassicae L.), F. R. PETHERBRIDGE and J. E. M. MELLOR (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 329–341, pl. 1*).—In a study of the life history of the cabbage aphid in the market garden areas of Bedfordshire, Cambridgeshire, and Huntingdonshire, England, from November 1933 to October 1935, a variation was found as to behavior during the 2 yr. "In 1934 this aphid overwintered only as eggs on cultivated cruciferous crops (and particularly brussels sprouts), whereas observations strongly suggest that in 1935 it overwintered both as viviparous females and eggs. The hatching of the eggs was much later in 1934 than in 1935, but the first winged forms were produced at about the same date.

"Predators and parasites were fairly abundant but not sufficiently so as to prevent serious damage. It is suggested that control measures should aim at preventing the aphids from passing from old plants to newly planted ones. Nicotine sprays or nicotine dusts are suitable for this purpose. The pest is difficult to control on ordinary field crops."

Studies on the aphides infesting the potato crop.—V, Laboratory experiments on the effect of wind velocity on the flight of Myzus persicae Sulz., W. M. DAVIES (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 401–408, pl. 1, fig. 1*).—Reporting further on studies of aphids infesting potatoes (E. S. R., 74, p. 668), the results of laboratory experiments on the effect of variation in wind velocity upon the flight of the green peach aphid are reported.

"When no wind passed through the experimental chamber, 25 winged aphids averaged 154.8 flights per minute. The incidence of flight in a range of wind velocities is recorded. Low wind velocities had a marked influence on flight, which ceased when the speed of the wind was increased to 3.75 miles per hour. The aphids remained stationary on the glass surface of the chamber when high

winds of 20 and 30 miles per hour passed through the chamber, and even when the full force of the wind, equivalent to a gale of 70 miles per hour, passed over them the aphids adhered to the surface with ease. Microscopical observation showed that the aphids possess a small membranous pad between each claw and another at the base of each tarsus; these are adpressed to the surface and facilitate adherence."

The literature on the subject of the dissemination of aphids by wind is reviewed, and the phenomenon of voluntary migration as compared with involuntary transportation is here discussed.

Effectiveness of low concentrations of nicotine in combination with other materials against black pecan aphid, G. F. MOZNETTE (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 970–972*).—Experimental control work with the black pecan aphid *Melanocallis caryaefoliae* Davis, conducted near Albany, Ga., during 1932, 1933, and 1934, in which low concentrations of nicotine in combination with various other materials were tested, is reported upon, the details being given in two tables. It was found that nicotine will control this aphid at strengths as low as 1:4,000 when combined with bordeaux mixture, white oil emulsions, and potassium oleate soap at the higher strengths used.

Four new aphids from Colorado, M. A. PALMER (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 273–278, figs. 4*).—Contributing from the Colorado Experiment Station, descriptions are given of four new species of Aphididae under the names *Amphicercidus maxsoni*, *Cinara pseudoschwarzii*, *Kakimia collomiae*, and *Macrosiphum breviscriptum*.

Halowax (chlorinated naphthalene) as an ovicide for codling moth and oriental fruit moth, E. P. BREAKEY and A. C. MILLER (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 820–826*).—In this contribution (E. S. R., 73, p. 342), the moths were induced to oviposit on the foliage of small apple and pear seedlings grown in 6-in. flower pots. "The age of the eggs varied from 1 to 4 days at the time the sprays were applied. All sprays were applied with a Devilbiss atomizer, type GS, operating at a constant pressure of 15 lb. At the end of a 10-day incubation period, the eggs were counted with the aid of a jeweler's binocular. Halowax was applied as a simple emulsion prepared by the writers. . . . The emulsifying agent, one of the sulfonated fatty alcohols, was used at 2 percent on the concentrate, and the formula called for 80 percent oil by weight or 80 percent oil and Halowax mixture. All sprays contained 1 percent oil or 1 percent oil and Halowax mixture. A total of 15,063 fruit moth eggs was used. Of these, 1,856 were in 13 checks taken throughout the season, with an average mortality of 3.3 percent, 2 going as high as 9 percent. Of the 7,344 codling moth eggs used, 1,500 were in 13 checks taken throughout the season, with an average mortality of 5.5 percent, 2 going as high as 11 percent. Eggs of both insects were killed with the same preparation, there being no apparent difference in the susceptibility of the two, and eggs of all ages were killed with equal facility."

It is deemed desirable to use Halowax in combination with white oil (petroleum). "Other things being equal, Halowax gives the best results when diluted with an oil having a viscosity of 80 sec. Saybolt. . . . Ratios as low as 1:7 were quite effective and the results less erratic than when oil alone was used."

European corn borer situation in Wisconsin, E. L. CHAMBERS (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 944–947*).—The history of the European corn borer in Wisconsin, where it first appeared in 1931, is reported upon.

Notes on clothes moth breeding, S. C. BILLINGS (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 1014–1016*).—The author found clean woolen goods to be nutritionally

deficient for newly hatched webbing clothes moths. "Ordinary house dust and food stains have a stimulating but variable effect on clothes moths. Fish meal and yeast have been found by other workers to be valuable nutritional supplements for clothes moths. Autoclaved yeast is superior to unautoclaved yeast as a clothes moth supplement. A method for procuring clothes moth eggs in quantity is described."

Experiments to control tobacco budworm, F. S. Chamberlin and A. W. Morrill, Jr. (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 967-970, fig. 1*).—The experiments here reported upon failed to reveal any satisfactory and safe substitute for the lead arsenate-corn meal mixture and demonstrated that several of the mixtures tried were harmful and should not be used by tobacco growers.

An ecological consideration of the diapause of Loxostege sticticalis L. (Lepidoptera, Pyralidae) [trans. title], D. M. Steinberg and S. A. Kamensky (*Bul. Biol. France et Belg., 70 (1936), No. 2, pp. 145-183, figs. 2*).—This consideration of the rest period of the beet webworm is presented with a list of 50 references to the literature.

The hessian fly and its control, L. Haseman (*Missouri Sta. Circ. 192 (1936), pp. 4, fig. 1*).—This brief practical account is accompanied by a map showing the hessian fly-free dates in the State.

[Flies and fly trapping] (*North Dakota Sta. Circ. 60 (1936), pp. 12, figs. 5*).—Two contributions are here presented.

I. *Fly trapping and its application to human welfare,* J. A. Munro (pp. 3-8).—Flies as transmitters of disease, conditions which favor fly development, disposal of materials in which flies breed, methods of trapping, and the results to be expected are considered.

II. *Seasonal appearance and relative abundance of flies caught in a baited trap at Fargo, North Dakota,* W. G. Bruce (pp. 9-12).—The results of a study of the seasonal appearance and relative abundance based upon flies caught in a baited trap at Fargo in 1929, 1930, and 1931 are reported. Two lists are given of the species collected (18 in number), one with the dates of their appearance and the other arranged according to their relative abundance for the entire season. Charts showing the seasonal abundance of all flies and the percentages of the most abundant flies in 1930 are included.

***Further observations on the behaviour of Wohlfahrtia vigil (Walk.),* with notes on the collecting and rearing of the flies,** N. Ford (*Jour. Parasitol., 22 (1936), No. 4, pp. 309-328, figs. 5*).—This contribution on the behavior of the sarcophagid *W. vigil*, supplementing the observations previously noted (E. S. R., 68, p. 790), is presented with a list of 22 references to the literature.

Repellency of pine-tar oil to wound-infesting blowflies, E. R. McGovran and L. O. Ellisor (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 980-983*).—When pine tar oil was applied at intervals of from 1 to 5 days to wounds on goats and sheep that had been infested with screwworms (*Cochliomyia americana* C. & P.), daily applications of this material reduced the reinfestations nearly 97 percent. Applications at 2- or 3-day intervals reduced the number of reinfestations but were much less effective than daily treatments. Treatment at 4- or 5-day intervals slightly reduced the number of reinfestations. Even where the number of reinfestations was not greatly reduced, the total number of egg masses or larvae deposited on the wounds that had been treated was markedly less than on the untreated wounds.

Relation of fertilizers to seed corn maggot injury to spinach seedlings, W. J. Reid, Jr. (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 973-980, fig. 1*).—The results of a study of the seed-corn maggot on commercially grown spinach during four seasons are reported upon. The seedling stage of the spinach crop

is particularly susceptible to attack by this pest in the coastal area of the Carolinas in the late fall and early winter months. Commercial fertilizers, which are used extensively for spinach production in that region, often contain organic materials known to attract and stimulate oviposition and serve as food for its larvae. When applied before the crop is planted they were found to play an important role in the severity of the attack on the seedlings. "The presence in fertilizer mixtures of such organic materials as cottonseed meal, fish products, and animal tankage greatly increased the insect infestation, thereby resulting in decreased plant stands and crop yields. The decreases were, in general, in proportion to the quantity of the organic materials used. Insect infestations were least and plant stands and yields were highest when no fertilizer was used in advance of the planting, the desired quantity of fertilizer being put on after the crop was thinned and had passed the susceptible seedling stage. The use in a 50 percent organic mixture of a superphosphate made with sludge sulfuric acid resulted in an increase in yield as compared to the use of a similar fertilizer mixture containing ordinary superphosphate. Although in trapping studies castor-bean meal had not proved so attractive to adults of the seed-corn maggot as had other organic materials, the use of castor-bean meal in a 50 percent organic fertilizer mixture resulted in only a slight increase in yield over that of a similar mixture containing cottonseed meal, fish meal, and animal tankage."

Fly control on A. & M. farms, Stillwater, Okla., F. A. Fenton and G. A. Bieberdorf (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 1003–1008, figs. 2*).—The details of fly control work on several farms on which there were six large barns in addition to sheds where several hundred head of cattle, swine, horses, and sheep were kept are reported upon.

The nutritional requirements of the larva of the mosquito Theobaldia incidens (Thom.), F. M. Frost, W. B. Herms, and W. M. Hoskins (*Jour. Expt. Zool., 73 (1936), No. 3, pp. 461–479*).—In the studies reported, presented with a list of 32 references to the literature, baker's yeast was found to be an adequate diet for the larvae of *T. incidens*. "The most favorable concentration is 2 to 2.5 mg per cubic centimeter. The tolerated pH range is from less than 5 to at least 8. In a few experiments young larvae were reared to the adult stage under sterile conditions, but most runs were made by the method of daily transfer of larvae to fresh food. Dried brewer's yeast is an adequate food when supplied at the concentration of 1 mg per cubic centimeter."

Some observations on the amount of blood engorged by mosquitoes, H. H. Stage and W. W. Yates (*Jour. Parasitol., 22 (1936), No. 3, pp. 298–300*).—Observations of *Aedes aldrichi* Dyar & Knab and *A. vexans* Meig. extended over some 30 days, in the course of which large numbers of unfed and fully engorged females were weighed, led to the conclusion that each of 500 females obtained a meal of at least 0.001994 cc of blood per hour over each 24-hr. period. At that rate, the horse employed was bled to the extent of 23.92 cc, or approximately 0.05 pt., daily by the mosquito population of an island basin in the Columbia River where the observations were made.

The effect of light and darkness on oviposition in mosquitoes, B. Jobling (*Roy. Soc. Trop. Med. and Hyg. Trans., 29 (1935), No. 2, pp. 157–166*).—Experiments conducted with two races of *Culex pipiens* and the Indian *C. fatigans* have shown quite conclusively that just before oviposition the mosquitoes become more attracted to darkness than to light. "Almost all the egg rafts (4,583) were laid at night, when the difference in the illumination of the shady and of the open dishes was greatly reduced. This shows that the phototactic reaction in mosquitoes is very acute. The autogenetic mosquito

can develop perfectly, mate, and lay fertile eggs in complete darkness. In complete darkness oviposition is governed either by the chemical condition of the water or water vapor or the combined action of these factors, because the stimulus producing the phototactic reaction is absent. Of all the infusions the mosquitoes prefer that of hay, but they may lay more rafts in other infusions exposed to more favorable light conditions. The tactic reactions of mosquitoes are greatly influenced by the blood meal."

New Central American Agromyzidae, S. W. Frost (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 298–318*).—A key is given to Central American leaf-mining Diptera of the family Agromyzidae, followed by descriptions of 16 new species of the genus *Agromyza* and 1 of the genus *Phytomyza*.

Attraction of cucumber beetles to the buffalo gourd, J. C. Elmore and R. E. Campbell (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 830–833*).—Preliminary experiments have indicated that both the ground parts and the extracts of the buffalo gourd are very attractive to western striped, western spotted, and belted cucumber beetles, thus suggesting the possibility of utilizing the attractive substance present in this plant as bait. Such a bait might prove particularly effective in attracting and trapping or poisoning the overwintering cucumber beetles during their initial migration into the cultivated fields in the spring.

Control of the Japanese beetle on fruit and shade trees, W. E. Fleming and F. W. Metzger (*U. S. Dept. Agr. Circ. 237, rev. (1936), pp. 12, figs. 9*).—This revision supersedes Circular 317 (E. S. R., 72, p. 81) as regards fruit and shade trees. Control of the Japanese beetle on ornamental shrubs is now being treated in Circular 401.

Control of the Japanese beetle and its grub in home yards, W. E. Fleming and F. W. Metzger (*U. S. Dept. Agr. Circ. 401 (1936), pp. 15, figs. 8*).—This is a revision of and supersedes Circular 326 (E. S. R., 72, p. 81).

Preventing injury from Japanese and Asiatic beetle larvae to turf in parks and other large areas, W. E. Fleming (*U. S. Dept. Agr. Circ. 403 (1936), pp. 12, figs. 5*).—This is a revision of and supersedes Circular 238 (E. S. R., 68, p. 72).

A method for estimating populations of larvae of the Japanese beetle in the field, W. E. Fleming and F. E. Baker (*Jour. Agr. Res. [U. S.], 53 (1936), No. 5, pp. 319–331, figs. 7*).—The need for a method of examining small portions of a given area by which the density of larval populations could be estimated from time to time in order to obtain information on the effectiveness of chemical and mechanical control measures without disturbing all the soil led to the work here described. The number of larvae in each square foot of four 2,500-sq.-ft. plats was determined and the results used in estimating the true averages in each plat by different methods. "By proper sampling it was found to be possible to obtain a reliable estimate of the larval population in a given area."

"The 1-sq.-ft. unit was found to be the most accurate for estimating the population. As the size of the sampling unit was increased, the error became progressively larger. The size, and not the shape, of the sampling unit was the modifying factor. The error of the estimate is influenced to some extent by the density of the population. It is possible to estimate a dense population more accurately than a sparse population. It is recommended that in estimating the larval population a minimum of 25 units of 1 sq. ft. uniformly distributed constitute a sample from plats containing less than 2,500 sq. ft., and in larger areas that the units be spaced not more than 10 ft. apart. The larval populations can be estimated most accurately with a minimum of labor in large areas covering several acres by estimating the number of larvae in 2,500 1-sq.-ft. plats placed in representative portions."

Some notes on the biology and economics of some British chafers, J. H. FIDLER (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 409–427, figs. 2*).—The author notes that while there are few crops that are not attacked by the larvae, the damage caused by adult May beetles in the British Isles is not important. Reference is made to their tendency to concentrate in large numbers and oviposit in one field while neighboring crops remain free from infestation. "The distribution, which is local, is shown to be controlled by the sparseness of suitable habitats and by the prevailing conditions of temperature and humidity. The factors which control the varying lengths of the life cycle are also considered to be mainly temperature and humidity. Thus, although *Serica* always takes 2 yr. to develop, *Amphimallus solstitialis* may take either 2 or 3 and *M. melolontha* 3 or 4 yr., according to the conditions controlled by these two factors. Regular flight years are usual on the Continent, but are much less definite in the British Isles, and the numbers of beetles appearing are relatively small. It is suggested that the reason for this is the differences in climatic conditions, particularly in spring."

Flooding as a means of reducing wireworm infestations, M. C. LANE and E. W. JONES (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 842–850, figs. 4*).—The results of three seasons' investigations pertaining to the killing of wireworms by flooding the infested soil, conducted principally at Walla Walla, Wash., are reported upon.

"Laboratory experiments with wireworms submerged in water alone showed that temperature is an important factor in the death of wireworms, and when soil was added to the water the wireworms were killed in about one-sixth the time required when water alone was used. When submerged under soil at 77° F., 100 percent of the wireworms were killed in 7 days. Results with adult beetles were practically the same as those with larvae. Outdoor cage experiments in the sun demonstrated that a large percentage of the wireworms could be killed within a week or less by flooding when the mean soil temperature was between 70° and 76°. Larger field tests further demonstrated the possibility of flooding as a means of reducing wireworm populations. From 95 to 100 percent of the wireworms were killed within 1 week at a mean submerged soil temperature of 75° or above.

"Flooding as a means to reduce wireworm numbers offers practical possibilities under conditions where high soil temperatures (70° or above) can be maintained for several days during the year, and where the soil topography and water supply render the adoption of this method practicable."

Laboratory tests on comparative effectiveness of fumigants against cigarette beetle in cigars, S. E. CRUMB and F. S. CHAMBERLIN (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 983–992, fig. 1*).—A series of experiments with various fumigants for control of the cigarette beetle in cigars are reported upon, the details being given in tables. The comparative effectiveness of the various materials was demonstrated, promising lines for further investigations being indicated.

"Chloropicrin, tested at atmospheric pressure and at reduced pressure, did not give a satisfactory kill of the cigarette beetle in cigars, and the compound had a tendency to produce a disagreeable flavor in the product. A mixture of ethylene dichloride 75 percent and carbon tetrachloride 25 percent, and carbon tetrachloride alone, tested at atmospheric pressure, were found to be unsatisfactory as cigar fumigants. The mortality was not sufficiently high, and these fumigants had a tendency to leave a disagreeable flavor in the cigars. Carbon disulfide, tested at atmospheric pressure at dosages of 10, 8, and 6 lb. per 1,000 cu. ft. with exposures of 8, 15, and 24 hr., respectively, gave complete kills of all stages of the cigarette beetle, except that 1 larva out of

419 survived with the 8-lb. 15-hr. combination. Heavy dosages of this fumigant did not give complete kills with a 4-hr. period of exposure under the conditions of our experiments, even when assisted by low pressure. The gas left cigars rapidly upon exposure to the air, and there was no perceptible change in the flavor.

"The experiments with liquid hydrocyanic acid gas at atmospheric pressure indicated that this gas does not penetrate cigars very rapidly and that a dosage of 2 lb. per 1,000 cu. ft. with an exposure of 15 to 24 hr. is required for complete kills. While experiments with liquid hydrocyanic acid at reduced pressure indicated relatively high mortality with a dosage of 7 oz. per 1,000 cu. ft. and a 2-hr. exposure period, it was found necessary to increase the dosage to 3 lb. per 1,000 cu. ft. and the period of exposure to 4 hr. before complete kills could be obtained consistently with a vacuum of 26 in. The gas did not leave any perceptible odor in the product."

A study of the food relations of the Lyctus powder-post beetles, E. A. Parkin (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 369–400, pl. 1, figs. 4*).—Following a brief introduction, a general account of the *Lyctus* powder-post beetles, and the material studied, this contribution deals with the larval digestive system, the role of micro-organisms in relation to digestion, an investigation of the food requirements of *Lyctus* larvae, selection of wood for oviposition, and starch in timber, presented with a list of 35 references to the literature.

Fumigating sweet potato seed with PDB to control sweet potato weevil, K. L. Cockerham and O. T. Deen (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 992–1000, figs. 5*).—Experiments conducted at Biloxi, Miss., the details of which are given in tables, have shown (1) that 100 percent of all stages of the sweetpotato weevil can be killed by fumigating seed tubers in barrels with 1 oz. of paradichlorobenzene per 50 lb. of potatoes for 21 days, and in storage banks with 1.5 oz. of paradichlorobenzene for 28 days or 2 oz. of paradichlorobenzene for 21 days; (2) that germination is retarded slightly but not, on the whole, reduced; (3) that soft rot (*Rhizopus nigricans*) is reduced or prevented by fumigation; and (4) that the use of paradichlorobenzene is so economical that it may be employed even by growers operating on a small scale.

The influence of constant temperatures and humidities on the rate of growth and relative size of the bean weevil (Bruchus obtectus Say), H. Menusan, Jr. (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 279–288, figs. 5*).—In the studies reported bean weevils, confused flour beetles, and yellow mealworms were reared at constant environments on an excess of suitable food. Both temperature and humidity influenced the size of resultant adults and the rate of growth of the larvae. Both the temperature and the humidity, therefore, influenced the rate of insect metabolism.

"Increasing the relative humidity of the air from 10 to 90 percent at all the temperatures tried (17° to 31° C.) decreased the time required for development and increased the size of the resultant adults. When the moisture content of the food and the relative humidity of the environment was held constant, the adult weight increased as the temperature decreased.

"The differences in weight of adults or in growth of larvae were not due to differences in water content. The water content of adult bean weevils remained practically constant regardless of the humidity or temperature of the environment at which they were reared. Similarly, with the mealworms the percentage of bodily water was inversely proportional to the size of the larvae and, within the range of the experiments, independent of temperature or humidity."

Status of the alfalfa snout beetle in New York, Brachyrhinus ligustici L., C. E. Palm (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 960–965*).—The information

here presented supplements that given in [New York] Cornell Experiment Station Bulletin 629 (E. S. R., 74, p. 74).

Recent developments in regard to alfalfa weevil, L. M. GATES (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 947–953*).—A discussion of the status of the alfalfa weevil and means for its control, particularly as related to the application of quarantine.

[Contributions on apiculture] (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 860–908, figs. 6*).—Contributions relating to apiculture here presented include the following: Fundamental Principles and Practices in Extension Apiculture, by G. H. Rea (pp. 860–867); The Wisconsin Occupational Bee Tax, by E. L. Chambers (pp. 867–870); Value of Foods Other Than Pollen in Nutrition of the Honeybee, by M. H. Haydak (pp. 870–877), contributed from the Minnesota Experiment Station; Preparation, Shipment, and Installation of Package Bees, by J. E. Eckert (pp. 877–885); Relation of Airplane Dusting to Beekeeping, by J. E. Eckert and H. W. Allinger (pp. 885–895); and Laboratory and Field Tests of Chlorine Treatment of Honey Combs, by J. D. Hitchcock (pp. 895–904), *contributed from the Minnesota Experiment Station.*

Challenge of the Argentine ant, C. LYLE (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 965–967*).—A brief discussion of the status of the Argentine ant.

New species and records of Nearctic mutillid wasps of the genus Dasymutilla (Hymenoptera), C. E. MICKEL (*Ann. Ent. Soc. Amer., 29 (1936), No. 1, pp. 29–60, figs. 3*).—In this contribution from the Minnesota Experiment Station descriptions of new species, records, and notes are added to the knowledge of the genus *Dasymutilla* as presented in the author's revision of the genus in 1928 (E. S. R., 59, p. 660). A revised key to the species is included.

Two new genera and five new species of Mutillidae, C. E. MICKEL (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 289–297, figs. 5*).—The genera *Lomachaeta* and *Anommutilla* are erected and four species of the former and one of the latter described as new in this contribution from the Minnesota Experiment Station.

A second revision of the chalcid flies of the genus Harmolita (Isosoma) of America north of Mexico, with descriptions of 20 new species, W. J. PHILLIPS (*U. S. Dept. Agr., Tech. Bul. 518 (1936), pp. 26, pls. 10, figs. 4*).—In this second revision of the genus *Harmolita*, a group of chalcid flies of great importance, descriptions are given of 20 species new to science, which, with 10 other species previously described, have come to attention since the genus was revised in 1919 (E. S. R., 41, p. 667).

A biological phenomenon affecting the establishment of Aphelinidae as parasites, S. E. FLANDERS (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 251–255*).—In observations at the California Citrus Experiment Station the author has found that in a number of species of the family Aphelinidae the immature progeny of unmated females are normally parasitic on the immature progeny of mated females. It is pointed out that in an attempt to establish certain of these species this fact must be taken into consideration.

Hymenopterous parasites of Coleophora pruniella Cl., and parasites recorded from other species of Coleophora, M. H. DONER (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 224–244*).—This contribution from the Wisconsin Experiment Station presents data obtained during a study of the parasites of the cherry casebearer at Sturgeon Bay, Door County, during the summers of 1930 to 1933, inclusive. Thirty-two species of parasites, representing 3 braconids, 5 ichneumonids, and 24 chalcids, were reared from this pest by the author. In 1932, 75.3 percent of all the parasites encountered were *Microbracon pygmaeus* (Prov.), the figure dropping to 26.1 percent in 1933. *Ephialtes* (*Itoplec-*

tis) conquisitor (Say) and *Scambus* (*Epiurus*) *indagator* (Cress.) increased from 2.1 percent in 1932 to 27.4 percent in 1933; *Habrocytus thyridopterigis* How. from 3.7 percent to 13.7, and *Eurydinota lividicorpus* (Gir.) from 5.9 to 18.5. The amount of parasitism in various orchards in the county varied greatly, that of overwintering larvae never exceeding 23 percent and that of mature larvae ranging from 5 percent in some highly infested orchards to 58.8 among light to moderately infested orchards.

A list is given of 30 references to the literature cited.

Transference of a mite from cyclamen to strawberry, D. O. Boyd and W. E. H. Hodson (*Nature* [*London*], *137* (*1936*), *No. 3466*, *p. 581*).—Reference is made to an experiment conducted which is thought to be the first to demonstrate successfully the ability of the cyclamen mite (*Tarsonemus pallidus* Banks, *T. fragariae* Zimm.) to transfer from cyclamen to strawberry.

Ornithodoros hermsi Wheeler as a vector of relapsing fever in California, W. B. Herms and C. M. Wheeler (*Jour. Parasitol.*, *22* (*1936*), *No. 3*, *pp. 276–282*).—This further contribution on *O. hermsi* (E. S. R., 74, p. 525) relates to its transmission of relapsing fever in several counties in California, including information on the technic employed and on the life history and habits of the tick. The life cycle from egg to egg under laboratory conditions requires about 4 mo.

ANIMAL PRODUCTION

[Livestock experiments by the Georgia Station] (*Georgia Sta. Rpt. 1936*, *pp. 15–19, 20, 21*, *figs. 3*).—Results are reported on the value of pastures with and without cottonseed meal for beef heifers; the comparative value of cottonseed meal, peanut meal, and ground velvetbeans (in the pod) as protein supplements for fattening beef cattle; the occurrence of onion flavor in meat; the type of brood mare suitable for mule production in the South; and grading up native sheep through the use of purebred rams.

Growth and development with special reference to domestic animals.—XL, Comparison between efficiency of horse, man, and motor, with special reference to size and monetary economy, S. Brody and R. Cunningham (*Missouri Sta. Res. Bul. 244* (*1936*), *pp. 56*, *figs. 17*).—This series of studies is continued (E. S. R., 75, p. 831). Data on energy costs and efficiencies of horses, which are used in this study, have been previously noted (E. S. R., 72, p. 86).

It appears that the maximum gross efficiency of muscular work is of the order of 25 percent in large and small horses and also in humans. Moreover, the ratio of maximal oxygen consumption during exertion to basal metabolism, and the ratio of energy expenditure to basal metabolism either during peak efforts or during sustained heavy work are of the same respective order in horses and in man, leading to the conclusion that work-rate capacity of animals is not proportional to body weight but to basal metabolism, i. e., to body weight raised to the 0.73 power. The influences of such factors as body weight, load, speed, and horsepower and also environmental temperature, humidity, diet, and cardiorespiratory system on efficiency and work output are discussed.

Comparing the relative energetic efficiencies of horses and farm tractors for performing unit work at the rate of 1 hp., the gross efficiency of the horse while working is about 18 percent, and the ignition tractor about 13 percent. Including energy costs of maintenance, the all-day gross efficiency of the horse working at the rate of 1 hp. is 17, 16, 14, 13, 10, and 6 percent for 12, 10, 8, 6, 4, and 2 hours' work daily, respectively.

Nomograph charts are presented for rapid calculation of work output, energetic efficiency, and monetary returns for horses under varying conditions.

The influence of the stage of maturity on the chemical composition and the vitamin B (B_1) and G content of hays and pasture grasses, C. H. Hunt, P. R. Record, and R. M. Bethke (*Ohio Sta. Bul. 576 (1936), pp. 18*).—Employing rats as test animals, the authors have assayed numerous samples of alfalfa, clover, and timothy hays representing various stages of maturity and curing conditions for vitamins B_1 and G. The alfalfa samples contained from 1.6 to 2.5 units of B_1 and 5 to 13 units of G per gram, the clover 1.6 to 1.9 units of B_1 and 8 to 10 units of G, and the timothy from 0.5 to 1.4 units of B_1 and 2.3 to 8 units of G per gram. It is evident that these hays are significantly richer in vitamin G than in B_1. The content of both vitamins decreased as the plants matured, and in general are correlated with leafiness, greenness, and protein content of the sample. The analyses of a number of samples of bluegrass, rye, and wheat indicate that these plants compare favorably with alfalfa or clover cut at a similar stage of maturity in protein and vitamin G content. It is demonstrated that chicks may be satisfactorily used in vitamin G assay, the results as measured by growth and incidence of leg paralysis comparing favorably with the rat assay method.

Nutritive value of the protein in calf lungs, cow udders, and hog spleens, R. Hoagland and G. G. Snider (*Jour. Agr. Res. [U. S.], 53 (1936), No. 5, pp. 349–355*).—Continuing this line of investigation (E. S. R., 57, p. 389), rat feeding experiments were conducted to determine the nutritive value of the protein in calf lungs, hog spleens, and cow udders in comparison with beef round, also the supplemental value of each of these to the protein of corn meal and the value of certain mixtures of these products with and without corn. In all cases the rations contained 8 percent of protein.

The average gain in weight per gram of protein consumed over a 60-day test period for beef round, calf lung, hog spleen, and cow udder was 2.85, 2.75, 2.6, and 2.2 g., respectively. The protein in the beef, lung, and spleen each supplemented the protein in corn meal to a considerable degree, but the protein in the cow udder showed only a slight supplemental effect. Feeding a mixture of lung, spleen, udder, and cracklings showed that these proteins did not supplement one another materially, but in feeding the mixture with corn it appeared that these ingredients did supplement one another to some extent.

Studies in mineral metabolism, X–XXVI (*Union So. Africa Dept. Agr., Rpt. Dir. Vet. Serv. and Anim. Indus., 16 (1930), pp. 301–328; 17 (1931), pt. 2, pp. 433–472, figs. 16; 18 (1932), pt. 2, pp. 611–817, figs. 57*).—This series of studies has been continued (E. S. R., 62, p. 863).

X. *The effect of bonemeal feeding on the phosphorus partition of the blood of sheep,* S. D. Rossouw.—Trials with wether sheep on a low phosphorus basal ration but receiving various levels of bonemeal supplement showed that the inorganic phosphorus of the blood is greatly affected by the level of phosphorus intake, the concentration falling to a very low level in animals receiving no phosphorus supplement.

XI. *Mineral metabolism and blood analysis,* A. I. Malan.—A dry combustion method for the determination of phosphorus in the blood is outlined. The occurrence of low inorganic phosphorus of the blood as a diagnostic indication of aphosphorosis is discussed.

XII. *Phosphorus in the sheep industry.—A preliminary report,* P. J. du Toit, A. I. Malan, and S. D. Rossouw.—This is a detailed description of an experiment designed to determine the role of phosphorus in the nutrition of sheep and in the production of wool.

XIII. *The phosphorus partition of the blood of some animals*, A. I. Malan.—This paper presents a study of phosphorus partition, including lipoid phosphorus, organic acid soluble phosphorus, inorganic phosphorus, and nucleoprotein, as determined for a considerable number of species of mammals and also representatives of the orders of Amphibia, Reptilia, and Avia.

XIV. *Inorganic phosphorus in the blood of pregnant heifers*, A. I. Malan and J. G. Bekker.—In a study throughout gestation and early lactation it is noted that heifers receiving bonemeal maintained a higher level of inorganic phosphorus in the blood than the control heifers. Little difference was noted in the blood phosphorus content of calves from the two lots, both groups showing a rapid rise in blood phosphorus soon after birth and maintaining a higher level than that of their respective dams.

XV. *Potassium iodide in poultry farming*, A. I. Malan.—In trials extending over 4-mo. periods for each of two seasons no beneficial effects as regards mortality, egg production, or hatchability of eggs resulted from the inclusion of potassium iodide in the ration of laying hens.

XVI. *The microdetermination of some inorganic elements in blood and vegetation*, A. I. Malan and G. W. B. van der Lingen.—This article gives a detailed description of methods for the microdetermination of sodium, potassium, calcium, magnesium, phosphorus, and chlorine in blood and in plant tissue.

XVII. *Phosphorus in the nutrition of sheep (2nd report)*, P. J. du Toit, A. I. Malan, and J. W. Groenewald.—Sheep receiving the phosphorus equivalent of 2 lb. of good English hay made excellent gains, had good appetites, and maintained a normal level of inorganic phosphorus in the blood, while sheep on a phosphorus-deficient diet made no gains, lost appetite, and showed very low inorganic phosphorus in the blood. An excess of phosphorus gave poorer results than a ration supplying only sufficient phosphorus. A low calcium diet did not adversely affect growth of sheep, neither was the level of blood calcium affected by wide variation in the calcium-phosphorus ratio in the diet.

XVIII. *Phosphorus in the nutrition of sheep (Final report)*, P. J. du Toit, A. I. Malan, and J. W. Groenewald.—This final report confirms previous conclusions.

XIX. *Influence of phosphorus and other minerals on wool growth*, J. E. Duerden, V. Bosman, and P. S. Botha.—Neither the iodine nor the calcium intake exerted any significant influence on wool growth but a deficiency of phosphorus resulted in the production of a lighter fleece of shorter staple and finer quality than was obtained from a phosphorus-sufficient ration.

XX. *Iodine in the nutrition of sheep*, A. I. Malan, P. J. du Toit, and J. W. Groenewald.—The use of 0.02 g of potassium iodide per head daily to three groups of ewes each receiving different levels of phosphorus intake had no noticeable effect on the relative inorganic phosphorus content of the blood, i. e., no beneficial effects in this respect resulted from feeding the iodide. On the other hand, there was evidence of a harmful effect on reproduction in the ewes after 16 mo. on the iodine supplement.

XXI. *A comparison of phosphatic supplements for the prevention of aphosphorosis*, A. I. Malan and P. J. du Toit.—On the basis of phosphorus availability for cattle sodium phosphate, precipitated calcium phosphate, bonemeal, and degelatinized bone flour proved effective in the order listed, while supplements of superphosphate and particularly raw rock phosphate proved detrimental.

XXII. *Phosphorus, calcium, and protein*, J. S. Otto.—In a series of balance experiments with cattle on a phosphorus-deficient basal diet and receiving various forms and concentrations of calcium and phosphorus supplements, the

addition of disodium phosphate favorably influenced retention of both calcium and phosphorus, while a low phosphorus intake markedly increased calcium excretion in the urine. A high calcium low phosphorus intake resulted in lower utilization of phosphorus than when both were low in the ration. High phosphorus low calcium intake resulted in favorable phosphorus retention but also high excretion of phosphorus in the urine. The utilization of protein, carbohydrates, ether extract, and fiber apparently was not influenced by the level of calcium and phosphorus intake.

XXIII. *Phosphorus and iodine supplements in field experiments with sheep*, J. G. Bekker.—The administration of as little as 0.125 oz. of bonemeal per sheep daily as a supplement to a phosphorus-deficient ration gave beneficial results. Feeding either as 0.15 or 0.075 g of potassium iodide daily did not improve the utilization of phosphorus and was detrimental to reproduction in sheep when fed over a prolonged period.

XXIV. "*On the administration of phosphorus to animals through their water supply*," J. G. Bekker.—In trials with cattle of various ages under range conditions it is shown that the addition of disodium phosphate to the drinking water at the rate of 1.5 oz. daily per mature animal is a satisfactory method of providing a phosphorus supplement, provided the drinking water supply is controlled, i. e., when the animals do not have access to an open water supply.

XXV. *The effect of calcium and magnesium supplements on the growth of Merino sheep*, J. W. Groenewald.—In preliminary trials a group of mature heifers receiving 7 g of calcium carbonate per head daily made more rapid gains while a group receiving 3.5 g of magnesium hydroxide per head daily made only slightly greater gains than the control group receiving no supplement. Wool production was slightly increased in the calcium-fed group and was lower for the magnesium-fed group than the controls. No conclusions could be drawn from a group of ewes similarly fed.

XXVI. *The effect of fluorine on pregnant heifers*, P. J. du Toit, A. I. Malan, J. W. Groenewald, and G. van der W. de Kock.—In this trial two pregnant heifers, each fed a daily dosage of 5 g of sodium fluoride, soon showed poor appetite, lost weight, and developed characteristic swellings of the metacarpus and metatarsus. Post-mortem examination showed characteristic lesions of the long bones. This condition is ascribed to fluorine poisoning and is typical of the condition developing in animals receiving raw rock phosphate as a mineral supplement.

Studies in mineral metabolism, XXVII–XXXIII (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 1 (1933), No. 2, pp. 421–424, fig. 1; 2 (1934), Nos. 1, pp. 115–150, figs. 3; 2, pp. 565–606, figs. 14; 4 (1935), No. 1, pp. 229–239, figs. 4; 5 (1935), No. 1, pp. 189–200, figs. 3*).—This continues the above series of studies.

XXVII. *The effect of two different calcium phosphorus ratios upon the growth of calves*, P. J. du Toit, A. I. Malan, and J. W. Groenewald.—Two groups of young calves on a milk, grain, and hay diet received calcium carbonate at such a rate as to maintain a calcium oxide: phosphoric acid ratio of 1:1.4 and 1:0.3 for the two groups, respectively. There was no significant difference in the growth rate of the two groups over a 9-mo. experimental feeding period terminating when the calves were 1 yr. old, indicating that varying the calcium: phosphorus ratio in the ration of calves is of doubtful significance.

XXVII. *Modifications of the methods used at Onderstepoort for the determination of (1) magnesium and calcium, (2) potassium, in grass extracts*, C. R. Holzapfel.—This paper deals with modified analytical methods used in the course of these mineral metabolism studies.

XXVIII. *Methods for the microdetermination of iodine in biological material*, I. J. B. Blom.—This is a discussion of an improved technic for the microdetermination of iodine in biological substances.

XXIX. *The iodine content of foodstuffs in relation to the occurrence of endemic goitre in the Langkloof Valley*, I. J. B. Blom.—Such widely different results were obtained in the determination of the iodine content of feeding stuffs in different parts of South Africa that the author was unable to establish any fixed relationship between the iodine content of feeding stuffs and the incidence of endemic goiter.

XXX. *Variations in the iodine content of grasses at different stages of growth and a note on the iodine content of milk*, I. J. B. Blom.—An analysis of a number of species of grasses at different stages of growth and maturity throughout the season showed a marked variation in the iodine concentration of the different samples. Iodine analyses of a limited number of milk samples showed considerable variation in the milk of individual cows receiving the same diet. Feeding small quantities of potassium iodide caused an enormous increase in the iodine content of the milk.

XXXI. *Minimum mineral requirements of cattle.—(2nd report)*, P. J. du Toit, A. I. Malan, and J. W. Groenewald.—This report presents data on the requirements of growing and lactating cattle for calcium, phosphorus, magnesium, sodium, potassium, chlorine, and iodine.

XXXII. *The effect of different forms of sulphur in the diet upon the growth and wool production of sheep*, P. J. du Toit, A. I. Malan, J. W. Groenewald, and M. L. Botha.—Groups of Merino wethers receiving a sulfur supplement either as cystine, mixed sulfates, potassium sulfocyanate, or two levels of elemental sulfur were compared with a control group receiving no supplement. Over a 12-mo. feeding period no significant effect on rate of growth, quality of wool produced, mortality, or disease due to the presence of urinary calculi could be ascribed to any of the sulfur supplements.

XXXIII. *Iodine in the nutrition of sheep.—Second report*, A. I. Malan, P. J. du Toit, and J. W. Groenewald.—In a further study of the effect of iodine supplements in the ration, no beneficial effects as regards feed consumption, weight gains, wool production, general health, or reproduction resulted from the feeding to lots of ewes of 0.002, 0.02, and 0.06 g of potassium iodide daily. The addition of potassium iodide to sheep licks is discouraged unless definite evidence of iodine deficiency exists.

Effect of different forms of iodine on laying hens, V. S. Asmundson, H. J. Almquist, and A. A. Klose (*Jour. Nutr., 12 (1936), No. 1, pp. 1–14, figs. 4*).—This study at the California Experiment Station deals with the effect of feeding iodine either as oystershell, desiccated thyroid, sodium iodide, potassium iodide, iodosalicylic acid, diiodotyrosine, or iodized olive oil on laying hens.

Feeding moderate amounts of iodine in the above-named forms did not adversely affect body weight, feed consumption, or egg production of the hens except in the case of desiccated thyroid, which resulted in very low feed consumption after 3 weeks' feeding, followed by rapid loss of body weight and cessation of laying. Similar results were obtained when doses equivalent to 16,000γ of sodium iodide were fed daily per bird. The iodine content of the eggs varied widely with different sources of iodine and corresponded only approximately to the iodine intake, contrary to the results reported by the Ohio Experiment Station (E. S. R., 70, p. 517). In general, when the percentage of total iodine intake recovered in the feces was high, as occurred when iodosalicylic acid was fed, the iodine content of the egg was relatively low. Determination of the iodine content of certain body tissues showed the

thyroid to vary considerably in this respect, although this is of doubtful significance. The thymus contained appreciable quantities, while the ovaries, spleen, and other tissue contained minimal amounts.

Toxicity of food containing selenium as shown by its effect on the rat, H. E. MUNSELL, G. M. DEVANEY, and M. H. KENNEDY (*U. S. Dept. Agr., Tech. Bul. 534 (1936), pp. 26, figs. 7*).—This bulletin reports the results of an extensive investigation instigated in an effort to determine the causative agent for the so-called "alkali disease." Wheat grown in a district known to produce toxic grain when fed to rats produced toxic symptoms, the most prominent of which were retarded growth, generalized edema, and liver injury.

Identical symptoms were produced in rats receiving a normal diet to which small amounts of selenious acid or selenium salts were added. Controlled experiments demonstrated that these conditions were directly due to the toxic ration and in no way attributable to lowered food intake. Comparative tests indicated that on the basis of selenium content the wheat containing selenium was relatively more toxic than selenious acid, 9.8 p. p. m. of selenium in the former producing about the same degree of toxicity as 18.4 p. p. m. in the latter. The degree of injury to growth and reproduction appears to occur in direct proportion to the amount of selenium supplied in the toxic wheat. A ration containing 1.5 p. p. m. had no detectable effect; 3 p. p. m. did not affect growth, but slightly inhibited reproduction; 6 p. p. m. had a pronounced detrimental effect on both; and at 8.7 p. p. m. growth was stunted, very few young were born, and none reared.

The amount of selenium stored in the body is relatively small compared to the amount ingested, and storage is not cumulative, the maximum storage occurring in a few weeks after the animals received the toxic diet. The stored selenium is not entirely eliminated from the body after return to a normal diet, and the damage resulting from selenium, particularly the liver lesions, persists as a permanent injury after selenium is eliminated from the diet.

Some deficiency disorders resulting from emergency rations, J. S. HUGHES (*North Amer. Vet., 17 (1936), No. 3, pp. 22–26, figs. 2*).—This note from the Kansas Experiment Station discusses emergency feeding practices which have arisen as the result of prolonged drought in relation to evidences of malnutrition and dietary deficiency observed in various classes of livestock, with particular reference to vitamin A deficiency.

Commercial feeds in Kentucky in 1935, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and L. V. AMBURGEY (*Kentucky Sta. Regulat. Ser. Bul. 10 (1936), pp. 40*).—The results of the analyses of 1,124 samples of commercial feeding stuffs, together with definitions and other information as to feeds and their components, are presented (E. S. R., 74, p. 378).

Beet tops for fattening steers, G. E. MORTON, H. B. OSLAND, and R. C. TOM (*Colorado Sta. Press Bul. 90 (1936), pp. 11, figs. 2*).—This report presents results of feeding trials with fattening steers to determine the value of dried whole beet tops, dried ground beet tops, beet top silage, and stacked beet tops when added to a standard beet byproducts ration of corn, cottonseed cake, wet beet pulp, and alfalfa hay.

Using dried whole beet tops as a partial substitute for alfalfa hay gave very satisfactory results, promoting equally as rapid growth as that obtained from the standard ration. However, feed cost per unit of gain was somewhat greater when tops were fed. Using dried beet tops to replace all the alfalfa in the ration resulted in digestive disturbances after from 100 to 120 days' feeding, resulting in retarded gain and an increased feed cost per unit of gain. The slight improvement in feed value due to grinding the tops did not justify the

extra cost involved. Beet top silage, while undergoing very little spoilage, was not highly palatable and cost more than the feed it replaced. Each of the lots receiving stacked beet tops made relatively slow gains and at a higher feed cost per unit of gain than any other of the test lots.

The relative merits of steamed and raw potatoes in the feeding of fattening pigs, J. K. Thompson and J. Hargrave (*Jour. Min. Agr. [Gt. Brit.], 42 (1936), No. 11, pp. 1123–1127*).—In a feeding trial with fattening pigs, it is shown that the group on steamed potatoes made more rapid daily gain and at a lower feed cost per pig per day as well as lower feed cost per pound of gain. One pound of the ration containing steamed potatoes was equivalent to 1.34 lb. of ration containing raw tubers. It is concluded that raw potatoes may be classified as a moderately successful feeding stuff which under certain economic conditions would be of profitable feeding value.

Vitamins in the diets of pigs: The vitamins A and D content of whole and skim milk, young rye-grass, and sun-cured pasture hay, with reference to the vitamin requirements of pigs, M. M. Cunningham (*New Zeal. Jour. Sci. and Technol., 17 (1936), No. 5, pp. 673–678*).—Biological assay for vitamin A and vitamin D demonstrated skim milk to be practically lacking in both factors. Whole milk was found to contain 454 international units of A and 28 units of D per pint. Air-dried ryegrass and sun-cured pasture hay contained 35 units and 10 units of A per gram and 7 units and 6 units of D per 100 g, respectively. Evidence bearing on the vitamin A and D requirements of pigs and the suitability of these feeds in meeting their requirements are discussed.

Hay and pasture for sows during gestation and lactation, E. Martin (*Arkansas Sta. Bul. 336 (1936), pp. 17*).—A series of feeding trials has been conducted with young brood sows during gestation and lactation periods to determine the supplementary value of soybean, cowpea, and alfalfa hays to common brood sow rations. The hay was fed either ad libitum as long hay or ground and included as a definite part of the mixture, both with and without supplementary grazing crops.

The addition of good quality legume hay, either ground or long, to the extent of 10 percent or more of the ration during the gestation period permits sows or gilts to farrow satisfactory litters. However, feeding this ration during the suckling period resulted in heavy loss in weight of sows and inadequately nourished pigs. A ration of 1 part of ground legume hay to 2 parts of ground corn proved adequate during gestation but was too bulky for satisfactory results during lactation. A corn-tankage ration without supplement permitted the farrowing of apparently normal litters, but the pigs lived only a few days in most cases. The addition of legume hay to this ration overcame the nutritional deficiency and enabled the sows to raise their litters. Alfalfa proved most palatable of the three legume hays tested. In all cases pigs suckling sows on a ration including legume hay without pasture made slow gain and were unthrifty at weaning time, indicating that legume hay at best is a poor substitute for pasture. However, its use is recommended in cases where no grazing crops are available.

Hog raising under Muñoz conditions, A. Hernandez (*Philippine Jour. Anim. Indus., 3 (1936), No. 3, pp. 201–210, pls. 2, fig. 1*).—This article describes methods employed and the costs involved in raising hogs on a commercial scale under Philippine conditions.

The surgical removal of the gizzard from the domestic fowl, W. H. Burrows (*Poultry Sci., 15 (1936), No. 4, pp. 290–293, figs. 2*).—This article from the U. S. D. A. Beltsville Research Center describes a technic for the surgical removal of the gizzard from fowls. From 24 such operations 11 were suc-

cessful, while 7 of the failures were believed to be due to feeding too soon after operation, resulting in rupture of the anastomosis of the proventriculus and duodenum.

Effect of diet, range, and fattening on the physical and chemical composition of cockerels, H. M. Harshaw (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 5*, *pp. 357–368*).—This is a report of a study by the U. S. D. A. Bureau of Animal Industry on the physical and chemical composition of cockerels reared on a number of diets under both confinement and range conditions. Analyses were made on representative birds near maturity and on other birds of the same lots following a 2-week period of intensive fattening.

The rearing diet did not materially affect the physical composition of the birds in most cases. However, the total edible portion of the birds reared on range averaged from 6 to 8 percent higher than for those that were confined. This increase was primarily due to a greater proportion of leg and breast muscle. Fattening resulted in about a 6-percent increase in total edible portion without significantly affecting the percentage of leg or breast muscle. The various rations fed and conditions under which birds were reared also had relatively little effect on the chemical composition of the edible portions of the birds. However, rather pronounced changes in the chemical composition occurred during the fattening period. Seventy-three percent of the gain in weight during fattening was represented in the edible portion of the bird, while the gain in protein, fat, ash, and water during fattening was 9, 30, 0.4, and 33 percent, respectively, of the total gain in weight.

Effect of packing-house byproducts, in the diet of chickens, on the production and hatchability of eggs, H. W. Titus, T. C. Byerly, N. R. Ellis, and R. B. Nestler (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 6*, *pp. 453–465*, *fig. 1*).—This is a report of an extensive investigation by the U. S. D. A. Bureau of Animal Industry. The various packing house byproducts studied included meat meal, meat-and-bone meal, beef scrap, blood meal, and stick, each being tested individually and several being used in various combinations. In each case the test material was fed at a 20-percent level as a supplement to a basal ration of yellow corn, wheat bran, rolled oats, and alfalfa leaf meal.

In every case the egg production of birds on the byproducts rations was materially higher than for those on the basal diet, and in nearly all cases somewhat higher than that of birds receiving a meat-fish-milk supplement which was used as a positive check. In general, satisfactory hatchability was obtained from the egg produced on the byproducts ration, ranging from 70 to 80 percent in most cases. In a few instances decreased hatchability was encountered, apparently being closely associated with increased second-week embryonic mortality. Liquid stick and a mixture of blood meal and stick in the diet seemed to cause an increased embryonic mortality throughout the incubation period. Live weight gains, feed consumption, and egg size were generally satisfactory on the byproducts rations. Within the range studied, cooking temperature (maximum of 200° F.) and time of processing (maximum 8 hr.) had little effect on the quality of the meat scrap. A formula is presented which has been found to produce generally satisfactory results.

How much milk will laying hens take when water is also supplied? [trans. title], R. Fangauf and A. Haensel (*Arch. Geflügelk.*, *10* (*1936*), *No. 2–3*, *pp. 71–77*; *Eng. abs.*, *p. 77*).—In comparative tests with three lots of Leghorn pullets receiving a balanced ration with free access to water, a balanced ration with free access to both skim milk and water, and a ration containing no protein concentrate with access to both skim milk and water, respectively, it is shown that hens have no preference for milk over water, consuming approxi-

mately equal quantities of each. The addition of milk to the balanced diet did not increase egg production. Hens receiving the low protein ration did not consume sufficient milk during the winter months to maintain maximum production, but during the summer months their production was practically equal to the group receiving fish meal in the ration. Skim milk in the diet definitely improved fertility and hatchability of the eggs.

The effect of supplementary iodine on egg production and mortality in the laying flock, C. E. Lee, S. W. Hamilton, and C. L. Henry (*Poultry Sci., 15 (1936), No. 4, pp. 307–310*).—In a series of feeding tests with laying hens of three different breeds no beneficial effect on rate of egg production or on rate of mortality could be attributed to the addition of potassium iodide equivalent to about 2 mg of iodine per hen daily to a mash ration originally containing 715 parts per billion of iodine. Neither could it be shown that the addition of iodine in organic combination was any more effective than the addition of the potassium iodide.

Some viewpoints on the vitamin D requirement of poultry and factors relating thereto [trans. title], N. Olsson (*Nord. Jordbrugsforsk., 1936, No. 1–2, pp. 185–218, figs. 5; Eng. abs., pp. 214–216*).—Comparative feeding trials were conducted with four groups of White Leghorn pullets each housed behind ordinary window glass and receiving a basal diet low in vitamin D. Group 1 received no vitamin D supplement, while lots 2, 3, and 4 received 0.288, 0.864, and 1.44 g of cod-liver oil per bird daily, respectively.

Great individual variations in vitamin D requirement of the hens were noted, certain hens in group 1 being able to maintain production, shell quality, and hatchability of eggs without additional supply while the majority showed a definite need for a supplement. Based on group averages, a daily intake of 0.288 g of cod-liver oil was sufficient to maintain optimum production, although shell quality and hatchability were adversely affected at this level, while 0.864 g was ample for optimum hatchability. Rapid decrease in the percentage of shell weight in successively laid eggs is a reliable symptom of vitamin D deficiency. The need for further investigation on the cause of variation in the vitamin D requirements of individual hens is pointed out.

The effect of vitamin D intake of the hen on the bone calcification of the chick, R. R. Murphy, J. E. Hunter, and H. C. Knandel (*Poultry Sci., 15 (1936), No. 4, pp. 284–289, figs. 7*).—The Pennsylvania Experiment Station made bone photographs and bone ash analysis of 346 sets of bones from chicks 1, 2, 3, 4, 5, and 8 weeks of age and representing the hatch from lots of hens on 5 different levels of vitamin D intake.

The results clearly show that the vitamin D reserve and the bone ash content of young chicks is dependent on the vitamin D intake of the parent stock. This condition is revealed most clearly in 1-week-old chicks and is decreasingly less evident at 2, 3, and 4 weeks, while little or no effect could be noted in the 8-week-old chicks.

The vitamin-G requirement of poultry, L. C. Norris, H. S. Wilgus, Jr., A. T. Ringrose, V. Heiman, and G. F. Heuser ([*New York*] *Cornell Sta. Bul. 660 (1936), pp. 20, figs. 3*).—In this report the term "vitamin G" is used to designate the growth-promoting factor. A chick unit of vitamin G is proposed which is roughly equivalent to 1 μg (microgram) of flavine. Dried pork liver containing approximately 100 μg of flavine per gram has been assigned a value of 100 chick units of vitamin G per gram and is used as a unit of reference in this experiment.

The relative vitamin G content of common feeding stuffs used in poultry feeding is presented in tabular form. Dried yeast, dried whey, dried skim milk, and dehydrated alfalfa meal are among the most potent sources of this

vitamin, animal byproducts contain appreciable quantities, and cereals are a poor source of it.

The vitamin G required to produce normal growth in chicks to 8 weeks of age is established at about 290 units per 100 g of feed. In the laying ration 130 units of vitamin G per 100 g of feed appears sufficient to support normal egg production, while about 230 units per 100 g of feed are required to obtain optimum hatchability. The requirement of the chick for vitamin G is closely correlated with rate of gain, indicating that the vitamin is closely associated with growth and is not required to any great extent for maintenance.

Influence of light on ovulation in the fowl, D. C. WARREN and H. M. SCOTT (*Jour. Expt. Zool., 74 (1936), No. 1, pp. 137–156*).—This series of trials conducted at the Kansas Experiment Station was designed to determine the effect of light on ovulation in the hen as indicated by the time of egg laying.

Hens housed in a completely darkened room and subjected to continuous artificial light would lay at any hour of the day, with egg numbers approximately equally divided between day and night, while hens kept in darkness during the day and subjected to artificial light during the night would lay only at night. These changes in lighting conditions were not immediately reflected in the hens' laying reaction but required about 60 hr. to have their full effect, indicating that the influence of light in regulating laying occurs before ovulation, since it is further shown that interruptions which segregate the egg laying into clutches are due to a delay in ovulation rather than to an interruption or retardation of an egg while in the oviduct.

Critical tests showed that neither feed nor exercise could be considered as factors influencing the time of ovulation. Tests in which the color of light was varied through the use of filters and the light intensity was varied indicate that the light effect is not a quantitative one, suggesting that the laying response to light has a psychological basis.

Egg quality: The influence of climate and soil, R. COLES (*Jour. Min. Agr. [Gt. Brit.], 43 (1936), No. 4, pp. 317–332, pl. 1, figs. 4*).—Based on a study of the quality of eggs received at the central markets of England, the author shows that definite differences exist between different sections. Areas having a low relative humidity yield eggs having dense shells of low permeability and resistant to evaporation, while eggs from areas having high relative humidity have more porous shells which tend to deteriorate more rapidly, particularly when held in market centers having a low humidity. There is evidence that the permeability of the shell membrane follows a similar trend to that observed in the shell, although the shell is undoubtedly more important in controlling the rate of evaporation.

Shell quality is also related to the soil types predominating in a given region. The areas of fertile loam soils containing considerable sand yield eggs having thin but dense shells of low permeability, while eggs from the chalky soil areas have thicker but more porous shells. The relation between the normal amount of sunshine for a given area and the quality of eggs is also pointed out.

Variations in the percentage of thick albumin and yolk quality were noted and apparently are related to the soil types of the regions in which the eggs are produced, eggs of lowest quality coming from the regions of the infertile old rock soils, while highest quality eggs are produced on areas of the fertile loam and light clay soils. It is further shown that the yolk index is related to the pH value of the soils. The probable causes of these interrelationships are discussed at considerable length.

The height of the firm albumen as a measure of its condition, H. S. WILGUS, JR., and A. VANWAGENEN (*Poultry Sci., 15 (1936), No. 4, pp. 319–321, figs. 2*).—This contribution from the [New York] Cornell Experiment Station

describes an apparatus and technic for simply and accurately measuring the height of the firm albumin of eggs. In a study of the relation of the score for observed condition of the firm albumin to its measured vertical height, a correlation of −0.934±0.006 was found to exist, indicating that this measurement is an accurate aid in determining condition of the firm albumin.

The change in the concentration of ovoglobulin in egg white during egg formation, J. S. HUGHES and H. M. SCOTT (*Poultry Sci., 15 (1936), No. 4, pp. 349–351*).—The Kansas Experiment Station has compared the relative amounts of ovomucin, ovoglobulin, and ovoalbumin in the three layers of egg white in five pairs of oviducal and laid eggs. The ovomucin content in each of the three layers of egg white was lower in the laid eggs than in the oviducal eggs, while the ovoglobulin content was greater in each layer in the laid eggs, the greatest increase occurring in the inner thin layer.

It is suggested that the increased content of water-soluble protein fraction precipitated by 1.5 M sodium sulfate (ovoglobulin) is due to the change in the solubility of the proteins after their deposition in the egg white rather than to any infiltration of ovoglobulin through the shell membrane.

The effect of egg weight, quantity of total albumen per egg, and quantity of thick albumen per egg on hatchability, A. B. GODFREY (*Poultry Sci., 15 (1936), No. 4, pp. 294–297, figs. 2*).—At the U. S. D. A. Beltsville Research Center, it was found that within a breed of chickens there is a low but significant negative correlation between hatchability and either egg weight, weight of total albumin per egg, or weight of thick albumin per egg. There is also a significant curvilinear trend between hatchability and either egg weight or weight of total albumin. The percentage of thick albumin of the total albumin is not related to hatchability. In a comparison between breeds the high positive correlation between hatchability and each of the above-named factors is not significant.

The effect of tremulous air cells upon the hatchability of eggs, C. W. KNOX and M. W. OLSEN (*Poultry Sci., 15 (1936), No. 4, pp. 345–348*).—This study at the U. S. D. A. Beltsville Research Center conclusively shows that fresh eggs (as well as eggs 3 weeks old) having tremulous air cells have a much lower percentage hatchability than eggs of the same age having normal air cells.

Jarring eggs which were held with the large end downward readily produced tremulous air cells, but similar jarring while holding eggs with the small end downward did not produce such effect. Jarring did not affect fertility of eggs, neither did it affect hatchability unless tremulous air cells were produced. This study did not determine whether tremulous air cells are directly responsible for low hatchability or only an indication of the injurious effects of jarring on the embryo.

Investigations into the nature of the condition known as "floating yolk" in eggs, A. E. PLATT (*Austral. Jour. Expt. Biol. and Med. Sci., 14 (1936), No. 2, pp. 107–116, figs. 4*).—In studies of the abnormal condition of floating yolk frequently observed in candled eggs at various packing centers in South Australia, analysis of the egg white showed that the protein content of the abnormal eggs did not differ from that of normal eggs. A thickening and enlargement of the chalaza with evidence of disintegration at the distal end was invariably noted in the abnormal eggs. Inoculating cultures with portions of the finely ground chalaza of abnormal eggs nearly always resulted in the isolation of an aerobic spore-bearing Gram-positive bacillus, not definitely classified in this study but believed to be the causative agent of the floating yolk condition. In postmortem examination of birds laying abnormal eggs, a pure culture of this

organism was isolated from the mucous membrane of the upper end of the oviduct in one instance.

Twelve hens which consistently produced normal eggs were fed spores of this bacillus in their ration, and in each case these hens began laying eggs with floating yolks within a period of from 2 days to 3 weeks, the condition usually appearing in the second or third egg laid after commencement of the experiment. The probable role of this bacillus in relation to egg production is discussed.

Investigations into the condition known as "floating and cloudy yolk" in eggs, C. F. Anderson and A. E. Platt (*Jour. Dept. Agr. So. Austral., 39 (1936), No. 11, pp. 1342–1350, figs. 5*).—This article describes the same experimental work noted above and also presents data to show the widespread occurrence of this egg abnormality in large commercial poultry flocks in Australia. So far no relationship has been established between the occurrence of floating yolk and keeping quality of the egg.

Further studies on the preservation of eggs, A. Valenzuela and S. Y. Rotea (*Philippine Jour. Anim. Indus., 3 (1936), No. 3, pp. 211–220*).—From this extensive study it is shown that eggs stored in a 10-percent solution of either limewater or water glass may be expected to retain their freshness from 2 to 6 weeks, while eggs treated with the above solutions or light paraffin oil for from 5 to 20 days and subsequently placed in cold storage at from 32° to 36° F. remained in good condition for from 6 to 8 mo. More effective preservation was obtained by dipping eggs in paraffin oil under partial vacuum and treatment with carbon dioxide gas followed by storage at from 32° to 36°. Eggs treated in this manner retained their freshness with practically no shrinkage or weakening of the yolk for at least 9 mo.

Effect of relative humidity on the growth of mold on eggs in storage, P. F. Sharp and G. F. Stewart ([*New York*] *Cornell Sta. Mem. 191 (1936), pp. 11, figs. 2*).—The effect of humidity on mold growth on eggs has been determined by holding the eggs in sealed containers at 30° F. in a commercial storage plant for 17 mo. The relative humidity was accurately controlled by placing a suitable mixture of sulfuric acid and water in the containers. The primary series consisted of naturally clean eggs artificially inoculated with mold and held at relative humidities ranging from 88 to 100 percent by 2-percent intervals.

A dark mold growth developed on the eggs after 3 mo. or more at relative humidities of 96 to 100 percent. A meager white mold growth was observed at humidities as low as 90 percent after several months, and such growth eventually increased the mold infection of the egg content. No mold growth occurred at a relative humidity of 88 percent. The loss of moisture from the eggs during storage showed a direct linear relationship to humidity of the atmosphere, although fluctuations in the storage temperature caused a displacement of the relationship between relative humidity and loss of weight. The failure of mold to grow at lower humidities is possibly due to the shrinkage of the egg content which breaks the contact between the shell and content, and hence restricts the food supply on the outer shell surface. Dirty eggs supported luxuriant mold growth at lower humidities than clean eggs.

Effects of different temperatures in the incubator on the prenatal and post-natal development of the chick, A. L. Romanoff (*Poultry Sci., 15 (1936), No. 4, pp. 311–315, fig. 1*).—This is a description of incubation tests conducted at the [New York] Cornell Experiment Station.

Series 1 consisted of 12 lots of eggs, each incubated continuously at uniform temperature, with a range of from 35° to 40.5° C. by 0.5° intervals employed

for the different lots. Series 2 consisted of 13 lots of eggs each incubated at 37.5° for the first 16 days, after which the different lots were subjected to temperatures ranging from 29.5° to 41.5° by 1° intervals for the remaining incubation period. Series 3 was a repetition of series 2 within a range of 33.5° to 38.5°.

Continuous exposure below 37° or above 38° resulted in progressively lower hatchability with increasing distance from these limits. Lowering the temperature by as much as 3° after 16 days of incubation had no ill effects either on percentage of hatchability or physical well-being of the chicks up to 3 weeks of age. *The frequency of crippled chicks increased with either high or low extremes of incubating temperature.*

Comparison of growth in sexed and in unsexed pullets, W. L. Jourdain (*New Zeal. Jour. Agr., 52 (1936), No. 5, pp. 293–295*).—A single trial was conducted to compare the growth rate during the first 6 weeks of a group of pullets sexed when 1 day old and reared separately from cockerels with a similar lot of pullets fed and handled identically but reared in a mixed or unsexed group.

The sexed pullets averaged 1.33 oz. each at 1 day old and the mixed lot 1.47 oz., indicating that day-old cockerels are slightly heavier than day-old pullets. At 42 days of age the sexed pullets weighed an average of 12.66 oz. each and the unsexed pullets 10.39 oz., showing that the pullets grew more rapidly when reared by themselves.

A study of deformed breastbones in chickens [trans. title], P. Carstens, G. Wenzler, and J. Prüfer (*Arch. Geflügelk., 10 (1936), No. 4–5, pp. 97–129, figs. 11; Eng. abs., pp. 127, 128*).—Based upon regular biweekly examinations of 1,465 birds, including males and females of the White Leghorn, Brown Leghorn, and Sussex breeds, it is shown that many cases of curved breastbones are found at from 7 to 8 weeks of age, generally beginning during periods of active growth. The percentage of individuals showing this malformation was similar for the three breeds, although generally occurring latest in the Brown Leghorns. Cockerels were more susceptible to this ailment, while roosting greatly increased the frequency of the deformity for both sexes.

Early-hatched chicks showed the highest percentage of deformed individuals, those hatched at the normal date the least, and late-hatched chicks were intermediate. No correlation was found between laying and deformed breastbones nor between number of eggs produced by the mother and deformity in chicks, neither was production affected by its occurrence. Inbred and outcrossed strains were equally susceptible. The cause of low calcium metabolism resulting in this deformity was not established in this study. It is suggested that inherent differences in calcium requirements may exist.

DAIRY FARMING—DAIRYING

The nutritive value of proteins for milk production.—IV, A comparison of the proteins of (1) spring and autumn grass, (2) grass conserved as silage (A. I. V. acid treated, molasses treated, and ordinary untreated), and (3) grass conserved by drying, with notes on (a) the effect of heat treatment on the nutritive value and (b) the supplementary relations of food proteins, S. Morris, N. C. Wright, and A. B. Fowler (*Jour. Dairy Res. [London], 7 (1936), No. 2, pp. 97–121, figs. 10*).—Continuing this series of studies (E. S. R., 72, p. 526), extensive trials have been conducted to determine the nutritive value of the proteins for milk production from several sources. Complete data on these trials are presented in tabular and graphic form.

The proteins of spring grass were markedly superior to those in autumn grass as to increased milk production, decreased excretion of urinary nitrogen and sulfur, smaller creatine excretion, and higher biological value. There was no significant difference in protein value of the fresh and artificially dried grasses for either the spring or autumn samples. No significant differences were noted in protein values of the three types of grass silage, all having a biological value of the same order as that of fresh spring grass, although the feeding of A. I. V. silage was characterized by a marked increase in excretion of urinary ammonia nitrogen and also an increase in the creatine excretion. Blood meal prepared by a low temperature process has a definitely greater nutritive value than meals subjected to a high temperature. A pronounced supplementary value of two incomplete proteins, one deficient in lysine and the other in tryptophane, has been demonstrated.

The various feed proteins studied in these trials and also those included in earlier trials are classified according to their calculated biological values.

Korean lespedeza and Lespedeza sericea hays for producing milk, C. W. Holdaway, W. B. Ellett, J. F. Eheart, and A. D. Pratt (*Virginia Sta. Bul. 305 (1936), pp. 7*).—This bulletin presents results of two series of experiments comparing the composition, digestibility, and milk-producing value of Korean lespedeza and *L. sericea* hays with alfalfa hay. In 1935 the hays fed were graded as No. 2 alfalfa, No. 3 leafy yellowish-brown Korean lespedeza, and No. 2 leafy *L. sericea*. All were considered to be of medium quality. The 1936 lots were graded No. 1 alfalfa, No. 2 extra green Korean lespedeza, and No. 2 extra leafy *L. sericea*, and all were considered good quality hay.

In each trial the Korean lespedeza and *L. sericea* appeared about equal in total digestible nutrient content and in milk-producing value, each giving results equal to about 80 percent of those obtained from the alfalfa hay with which they were compared. The good quality leafy hays (1936) were noticeably higher in protein content, more digestible, and adjudged to be about 10 percent more valuable than the medium quality hays of the same variety.

Pasture tests with dairy heifers (*Georgia Sta. Rpt. 1936, pp. 14, 15, fig. 1*).—Results are noted on the value of pastures with and without cottonseed meal for growing dairy heifers.

Variations in milk production under Alabang conditions.—I, Seasonal variations, T. V. Rigor (*Philippine Jour. Anim. Indus., 3 (1936), No. 3, pp. 181–187, fig. 1*).—This article discusses factors causing variation in milk production, with particular reference to seasonal effect under Philippine conditions.

Estimating profitableness of dairy cows, S. Brody and A. C. Ragsdale (*Missouri Sta. Bul. 368 (1936), pp. 16, figs. 6*).—This is a popular presentation of the results of research previously reported (E. S. R., 75, p. 831).

Expressing yields in terms of live weight, W. L. Gaines (*Guernsey Breeders' Jour., 50 (1936), No. 4, pp. 268, 269, 276, 277, figs. 4*).—This report from the Illinois Experiment Station, based on analyses of official production records of Guernsey cows of various weights and ages, presents evidence to show that live weight and age are of about equal importance in their effect on butterfat yield. Inasmuch as feed costs are directly related to live weight, it is suggested that the expression of milk and butterfat yield in terms of units per 1,000 lb. of live weight has many advantages over the present widely accepted methods of comparing records on a mature equivalent or age-corrected basis in which age-correction factors are applied to records made under mature age. The point is stressed that yield per unit of live weight affords a common meeting ground for all breeds.

The effects of breed characteristics and stages of lactation on the vitamin C (ascorbic acid) content of cow's milk, R. Rasmussen, N. B. Guerrant, A. O. Shaw, R. C. Welch, and S. I. Bechdel (*Jour. Nutr., 11 (1936), No. 5, pp. 425–432, fig. 1*).—Based on the determination of the ascorbic acid content of a large number of milk samples from individual cows representing each of the five major dairy breeds at the Pennsylvania Experiment Station, it is shown that on similar rations milk from Brown Swiss cows averaged highest, being 48 percent greater than milk from Holsteins which averaged lowest. Milk of the Ayrshire, Jersey, and Guernsey breeds was of the same general order and intermediate between the first-mentioned breeds. Milk from cows of the same breed receiving similar rations showed wide variation in ascorbic acid content, with indication that stage of lactation has a more definite effect in this regard than breed differences. The ascorbic acid content of colostrum was unusually high. It was also relatively high in the milk early in lactation, but declined sharply, reaching a minimum from the second to third month of lactation and then gradually increased with advance of the milking period.

Certain problems related to the marketing of homogenized milk, P. H. Tracy (*Milk Dealer, 25 (1936), Nos. 4, pp. 30–32; 5, pp. 60–68*).—Based on studies at the Illinois Experiment Station, data are presented indicating that homogenization of milk at a pressure of 2,000 lb. or more results in a lowering of the curd tension and sufficient emulsification of the fat to prevent creaming and also a product not affected by freezing, while the color in the milk is reduced and its sensitiveness to sunlight is increased. Sediment formation can be reduced by clarification before homogenization and entirely eliminated by clarification following homogenization. The criticism that homogenization lowers keeping quality of milk is largely attributed to bacterial contamination resulting from ineffective sterilization of the homogenizer.

What causes most common off flavors of market milk? W. H. Chilson (*Milk Plant Mo., 24 (1935), Nos. 11, pp. 24–28; 12, pp. 30–34*).—This study at Cornell University has demonstrated that certain off flavors of milk described as papery, tallowy, metallic, etc., are due to oxidation in milk. The milk from different cows and from the same cow at different periods shows considerable variation in its susceptibility to oxidation, with milk from approximately 25 percent of the cows tested developing oxidized flavors without having come in contact with metals at any stage of processing. The oxidizing enzyme is carried in the milk serum, attacking the fatty acids of the true fat or certain substances adsorbed on the fat globule. It is not destroyed by ordinary pasteurization temperature, oxidized flavors occurring more commonly in pasteurized than in raw milk, but is destroyed at 170° F. for 10 min. and its action is completely checked by the presence of reducing agents. The presence of small quantities of certain mineral salts, particularly copper, greatly accelerated its action. In the absence of oxidizing enzymes no appreciable destruction of vitamin C occurred when milk was heated at 200° for 30 min.

Technique for obtaining anaerobic milk, with some observations on its CO_2 content, C. J. Jackson (*Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 25–28, figs. 2*).—This paper describes the technic for drawing milk anaerobically from the udder and for anaerobically transferring such milk either to an electrode vessel for determination of oxidation-reduction potentials or to a Van Slyke apparatus for gas analysis. The results of the analysis indicate that the carbon dioxide content of cows' milk is about one-half that of their blood plasma.

Note on the sulphydryl compounds of milk, C. J. Jackson (*Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 29, 30*).—Based on the nitroprussic test on a large number of milk samples it is noted that sulfhydryl compounds in free

solution could not be found in cow's milk. Milk treated with sodium cyanide will give a faint positive reaction to nitroprusside, probably due to the cystine in the protein complex.

Factors in the reduction of methylene blue in milk, C. J. Jackson (*Jour. Dairy Res.* [*London*], *7* (*1936*), *No. 1, pp. 31–40, figs. 3*).—Experimental evidence is presented to indicate that a number of factors exert a very pronounced influence on the rate of reduction of methylene blue in milk.

Milk drawn anaerobically from the udder reduces methylene blue almost instantly, while the same milk exposed to the air usually requires over 10 hr. for a similar degree of reduction. It is further shown that the oxidation-reduction potential of the anaerobically drawn milk is much lower than for the same sample after exposure to air. The rate of reduction is also catalyzed by exposure to light. It appears that some substance or redox system independent of the normally recognized constituents is present in milk which rapidly reduces methylene blue, although the nature of the substance is not fully demonstrated in this study.

Rapid reduction resulting from addition of a solution rich in lactoflavin suggests this substance is the source of the redox system. It appears that bacteria may play an insignificant part in the reduction of methylene blue in milk, although their deoxygenating action may be of influence in the commercial application of the test.

Relation of temperature and media to bacteria counts, A. Bradfield (*Milk Dealer*, *25* (*1936*), *No. 6, pp. 41, 52, 53*).—After examining 366 samples of raw milk for bacterial counts, the author concludes that both a modified tryptone, glucose, skim milk agar and the use of the lower incubation temperatures (32° C.) give consistently higher counts than those obtained by the standard method. Incubation temperature has a more pronounced effect on the count than the composition of the medium. Colonies on the modified medium are more pronounced and more easily counted than those on the standard medium.

The types of coliform bacteria in bovine faeces, J. F. Malcolm (*Jour. Dairy Res.* [*London*], *6* (*1935*), *No. 3, pp. 383–396*).—This investigation at the West of Scotland Agricultural College has demonstrated that *Bacterium coli* is by far the most prevalent type of coliform bacteria occurring in bovine feces, 107 of 114 samples examined yielding large numbers of *B. coli* while 96.4 percent of all cultures isolated by the ordinary method were of this type.

In further studies in which certain enrichment methods were employed, principally peptone water containing brilliant green or Koser's fluid citrate medium, a high percentage of feces samples yielded cultures of *B. aerogenes*, *B. cloacae*, and other Koser-positive types. This indicated their presence in most feces samples, though they normally occur in small numbers and may not be detected by ordinary methods. A proposed classification of the coliform group, based on the inosital, Koser citrate, indole, and Voges-Proskauer reactions, is presented.

The thermophilic and anaerobic nature of Lactobacillus bulgaricus, J. M. Sherman and H. M. Hodge (*Science*, *84* (*1936*), *No. 2174, pp. 208, 209*).—This contribution from the [New York] Cornell Experiment Station briefly describes a technic for isolating practically pure cultures of *L. bulgaricus* from fresh milk, the principal features of which were the addition of 0.05 percent of sodium sulfite to the agar medium and aerobically incubating the plates. It is regarded as significant that most freshly isolated strains grew at 60° C. and showed vigorous growth at 55°, whereas old laboratory cultures of the organism usually have a maximum temperature of growth of about 50°.

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Streptococci which produce a substance inhibiting the growth of lactic streptococci: Occurrence and distribution, G. A. Cox and H. R. Whitehead (*New Zeal. Jour. Agr., 52 (1936), No. 1, pp. 38–43*).—This study at the New Zealand Dairy Research Institute has demonstrated the frequent occurrence of a type of streptococci in normal milk which produces a substance inhibiting the growth of lactic acid streptococci. An enrichment technic is described for quickly testing for their presence. The organism apparently exists in the udders of some cows, while manure, silage, and the coats of the animals are other probable sources of contamination.

Bacteriophage phenomena in cultures of lactic streptococci, H. R. Whitehead and G. A. Cox (*Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 55–62, pl. 1, figs. 2*).—This describes the phenomena of inactivation of certain lots of pure lactic acid cultures used as cheese starter to such an extent that it failed to produce acid when added to milk in the cheese vat. It is demonstrated that this condition was caused by a bacteriophage which showed unusual activity under certain favorable conditions, aeration of the milk in which phage-infected cultures were grown having a marked stimulating action on the development of the phage. The characteristics of phages for lactic streptococci are described.

Mastitis streptococci in bulk milk, E. J. Pullinger (*Jour. Dairy Res. [London], 6 (1935), No. 3, pp. 369–382*).—Examinations of numerous samples of bulk milk at English milk depots have invariably shown the presence of beta-hemolytic streptococci, while a high percentage of samples examined from individual herds producing either certified or grade A milk have also shown the presence of this organism. A method for culturally examining gravity cream samples for the presence of this organism is described and its significance discussed, it being pointed out that this technic will frequently detect a low degree of infection not apparent in whole milk cultures. The fact that certain herds under observation have been consistently free from mastitis is considered proof that complete eradication of this disease is possible by practicing rigid control measures.

Influence of mastitis and of Brucella abortus infection upon the milk yield of cows, F. C. Minett and W. J. Martin (*Jour. Dairy Res. [London], 7 (1936), No. 2, pp. 122–144*).—An analysis of the production records of two tuberculosis-free dairy herds over 3- and 5-yr. periods, respectively, showed that, combining all lactations of both herds, mastitis reduced milk yield 954 lb. per lactation while mastitis and abortion combined resulted in a 1,685-lb. decrease. Among Ayrshires in one herd the reduction due to mastitis was 892 lb., while in a Friesian herd the average reduction was 1,602 lb. due to mastitis, 2,016 lb. due to abortion (although very few abortions occurred), and 2,302 lb. due to a combination of the two diseases. In all cases these reduced yields were shown to be statistically significant.

The chlorine content of milk as an indication of mastitis, J. W. Blood and A. Rowlands (*Jour. Dairy Res. [London], 7 (1936), No. 1, pp. 47–54*).—From a study of a large number of milk samples from both sound healthy udders and from mastitis-infected cows, it is shown that determination of the chlorine content of milk is not a reliable method for detecting the presence of mastitis. Milk samples from definitely infected quarters frequently showed a chlorine content within the range of so-called normal milk, i. e., from 0.07 to 0.12 percent, while samples from udders showing no evidence of mastitis frequently had a chlorine content above this range. Determination of chlorine by the rapid titration of diluted whole milk with silver nitrate invariably gave higher values than those obtained by analysis of deproteinated samples.

Studies in milk pasteurization, J. M. BRANNON and M. J. PRUCHA (*Ill. State Acad. Sci. Trans.*, *28 (1935), No. 2, pp. 203, 204, fig. 1*).—This note from the Illinois Experiment Station describes a series of feeding trials in which white rats receiving either raw milk or pasteurized milk as their sole diet were found at the end of a 5.5-mo. experimental feeding period to be practically identical in weight and to contain equal amounts of calcium and phosphorus in their skeletal tissue. This indicated that pasteurization had not adversely affected the nutritive value of the whole milk.

In one trial of the series rats on the raw milk diet showed an unthrifty appearance after 30 days, and eventually all individuals in this group died. Autopsies revealed an abnormal condition of the digestive tract with evidence of excessive gas formation, although the cause was not established. Since rats on pasteurized milk continued to thrive, it is indicated that the causative factor was destroyed by pasteurization.

Studies in the baterlology of low-temperature pasteurization.—II, The heat resistance of a thermoduric Streptococcus grown at different temperatures, E. B. ANDERSON and L. J. MEANWELL (*Jour. Dairy Res.* [*London*], *7 (1936), No. 2, pp. 182–191, fig. 1*).—Continuing this series (E. S. R., 70, p. 86), a strain of *Streptococcus* isolated from milk following laboratory pasteurization at 62.8° C. for 35 min. is described which shows increased resistance to heat as its temperature of growth is reduced below the optimum. The degree of resistance progressively increased during the early logarithmic growth phase.

Two cultures of streptococci were also noted to show a marked increase in heat resistance as a result of 24 hours' cold storage, the effect being most pronounced when the low temperature is applied during the early logarithmic growth phase. The possible significance of this phenomenon in relation to methods of handling milk on the farm and during transit is discussed.

A study of seasonal variation in butter fat.—II, A seasonal spectroscopic variation in the fatty acid fraction, R. G. BOOTH, S. K. KON, W. J. DANN, and T. MOORE (*Biochem. Jour.*, *29 (1935), No. 1, pp. 133–137, fig. 1*).—Continuing this study (E. S. R., 72, p. 685), in which it was previously shown that there is a pronounced seasonal variation in the power of butterfat to inhibit the reaction between vitamin A and antimony trichloride, 15 samples of butterfat produced between April 1932 and May 1933 were spectroscopically examined. The absorption of the fatty acids of the butterfat at 230 mμ showed a marked seasonal variation. Expressed as $E^{1\%}_{1\,cm}$, a minimum absorption value of 8.4 occurred in April immediately preceding the pasture season, while a maximum absorption of 25 was reached in May in each season shortly after the cows were turned on pasture. The increase in absorption runs approximately parallel with the increased inhibitory power to antimony trichloride reaction, although the substances responsible for the former reaction are less sensitive to oxidation and irradiation than those influencing the latter reaction. The presence of small amounts of unrecognized acids or of modified forms of known unsaturated acids with high extinction coefficients probably accounts for the increased absorption in summer butterfat.

Diacetyl in cold-stored butters, C. R. BARNICOAT (*Jour. Dairy Res.* [*London*], *6 (1935), No. 3, pp. 397–406, fig. 1*).—The New Zealand Dairy Research Institute has shown that butter made from unripened pasteurized fresh cream contains only traces of acetylmethyl carbinol while butters from slightly ripened cream contain both carbinol and diacetyl, indicating that the starter added to the cream is the primary source of these products.

There was no appreciable loss of the natural carbinol and diacetyl content of butter during 6 months' storage at from 14° to 17° F., but when as much

as 4 p. p. m. of diacetyl was added to butter considerable loss occurred during such storage. The addition of less than 1 p. p. m. of diacetyl to unripened cream butter imparted a rich aroma, while 4 p. p. m. produced an unnaturally harsh flavor.

Repasteurization of cream as a factor in preventing fishy flavor in butter [trans. title], B. PLATON and T. OLSSON (*Meddel, Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 467 (1936), pp. 24; Eng. abs., pp. 21–24; also in K. Landtbr. Akad. Handl. och Tidskr., 75 (1936), No. 4, pp. 439–460; Eng. abs., pp. 457–460*).—Continuing these studies (E. S. R., 74, p. 252), on the basis of five series of experiments it is definitely shown that the fishy flavor frequently developing in butter churned from pasteurized cream may be largely or entirely prevented by repasteurization by the flash method at 85° C. Fishy flavor occurred more frequently in butter from cream ripened to a high acidity than in butter from moderately acid cream. Repasteurization at 75° was only slightly less efficient than at 85°, and cooling over a surface aerator increased the effectiveness of reprocessing.

Studies on the chemistry of Cheddar cheese making.—IV, Lactose and lactic acid in whey and curd, the presence of bound water in curd, the existence of a Donnan equilibrium between curd and whey, and the rate of penetration of salt into curd, F. H. McDOWALL and R. M. DOLBY (*Jour. Dairy Res. [London], 7 (1936), No. 2, pp. 156–175, figs. 6*).—Continuing this series of studies (E. S. R., 76, p. 95), determination of the lactose and lactic acid content of whey, curd, and curd juice throughout the cheese-making process indicates that the conversion of lactose into lactic acid by starter bacteria is almost quantitative, confirming the observation previously made.

Determinations of the rate of penetration of salt into the curd showed that little salt reaches the center of each curd strip at the time cheese is normally hooped, but that within 12 hr. the salt distribution is quite uniform. A certain amount of the water in the curd is held as bound water, estimated to be about 0.2 to 0.3 g per gram of dry matter in curd. There is also evidence to show the existence of a Donnan equilibrium which controls the partition of ions between curd and whey, characterized as a membrane effect which tends to increase the concentration of anions and decrease that of cations in the whey, and also by an osmotic diffusion of water from the curd following salting which tends to dilute all the constituents of the whey.

Curd tension of milk and its relationship to firmness of curd in cheesemaking, G. P. SANDERS, K. J. MATHESON, and L. A. BURKEY (*Jour. Dairy Sci., 19 (1936), No. 6, pp. 395–404, figs. 5*).—Based on a study of over 300 samples of milk by the U. S. D. A. Bureau of Dairy Industry, it is shown that the rennet curd tension of whole milk as measured by the Hill Curd-O-Meter gives an accurate indication of the firmness of curd in milk to be used in cheese making. The determination of rennet coagulation time was also a fairly satisfactory measure, although the pH of the milk appeared to be the principal factor in determining the rate of coagulation while the percentage of casein is more important in influencing the rennet curd tension. The Hill curd test was not a satisfactory measure, tending to give high values on soft-curd milk and low ratings for very firm curd milk. The addition of calcium chloride decreased the stability of milk to both rennet and alcohol, while milks stable to rennet were also generally stable to alcohol.

Homogenization of whole milk markedly decreased the curd tension but did not change that of skim milk, which was invariably higher than for the corresponding whole milk, indicating that the softening of curd caused by

homogenization is primarily due to the physical hindrance of the finely dispersed fat globules on the aggregation of the casein molecules. Pasteurization of milk produces a softer curd and increases coagulation time, while the presence of mastitis gives similar results.

Fermentations in ensiled fodder with regard to cheese making [trans. title], J. VAN BEYNUM and J. W. PETTE (*Dept. Econ. Zaken.* [*Netherlands*]. *Verslag. Landbouwk. Onderzoek. No. 40 C* (*1934*), *pp. 777–839, pls. 2, fig. 1; Eng. abs., pp. 836–839*).—The frequent occurrence of "blowing" in cheese produced from milk of cows fed silage with a pH of 3.7 or above led to this investigation of the fermentations occurring in silage at various pH levels and prepared by different processes (E. S. R., 73, p. 834).

Fresh material ensiled in small laboratory units with sufficient hydrochloric acid or a mixture of hydrochloric and sulfuric acids (A. I. V. acid) to uniformly reduce the pH of the mass below 4 was not subject to butyric acid fermentation. In large silos, however, there are likely to be thick layers of chopped material not thoroughly mixed with acid at the time of filling, and considerable butyric acid fermentation may occur in such layers before the acid is spread by diffusion, even though the total volume of acid is sufficient to produce an average pH below 4. Ordinarily lactic acid fermentation occurs in silage with a pH above 3.5, and lactates may be further attacked by butyric acid bacteria (*Clostridium tyrobutyricum*). It is concluded that silage showing lactic acid fermentation and also the presence of *C. tyrobutyricum* is likely to cause subsequent blowing in cheese.

The manufacture of Neufchatel and cream cheese, E. L. REICHART (*Nebraska Sta. Bul. 303* (*1936*), *pp. 14, figs. 5*).—Results of experiments in making Neufchatel and cream cheese indicate that (1) good quality starter is a better coagulant than rennet, the best results being obtained when the amount of starter and time of coagulation are so controlled as to produce an acidity of from 0.6 to 0.7 percent at the time of drainage; (2) the higher the fat content, the smoother will be the finished cheese and the better its keeping quality and flavor; (3) homogenization of the milk or cream at from 2,000 to 3,000 lb. before coagulation lowers the fat loss in the whey, and homogenizing the curd at from 300 to 500 lb. facilitates drainage and produces a smoother finished product; and (4) heating the curd at from 120° to 125° F. and holding for 15 min. gives most satisfactory body and keeping quality.

Methods of making these cheeses in the commercial plant and on the farm are briefly discussed.

VETERINARY MEDICINE

A high speed vacuum centrifuge suitable for the study of filterable viruses, J. H. BAUER and E. G. PICKELS (*Jour. Expt. Med., 64* (*1936*), *No. 4, pp. 503–528, figs. 14*).—A description is given of a centrifuge in which the speed is limited only by the strength of the material of which the rotor is made. "It carries 16 tubes, each of which conveniently accommodates 7 cc of fluid. The centrifuge operates in a very high vacuum and therefore requires only a small amount of driving energy. The arrangement has been found to eliminate the possibility of producing injurious frictional heat. The rotating parts are supported by an air bearing and are driven by compressed air. The centrifuge has been successfully operated at a speed of 30,000 r. p. m., representing a maximum centrifugal force in the fluid of 95,000 times gravity. Celluloid tubes used for centrifugation of fluid at high speeds are described. Experiments are described in which good sedimentation of the yellow fever virus was obtained."

Further studies on the differentiation of the virus of vesicular stomatitis from that of foot-and-mouth disease, with particular reference to a rapid and certain method of resolving mixtures of the two viruses, I. A. Galloway and W. J. Elford (*Brit. Jour. Expt. Path., 16 (1935), No. 6, pp. 588–613, figs. 3*).—This is a report of work conducted on behalf of the Foot-and-Mouth Disease Research Committee (E. S. R., 66, p. 667).

"Vesicular stomatitis virus which has been passaged in eggs is found to filter somewhat more easily than virus which has been passaged only in guinea pigs. This suggests that the virus undergoes some slight modification, either in size or surface properties, by passage in eggs. This modification, although definite and not easily reversible, is not of a sufficient magnitude to affect adversely the writers' original conclusion regarding the size of the virus [E. S. R., 72, p. 691]."

Employing a standard technic, which is described, the virus of foot-and-mouth disease was found not to survive even for 24 hr. in a total of 58 developing hen's eggs inoculated (E. S. R., 72, p. 691; 73, p. 397). The majority of these experiments were made with the G. F. strain of virus (Vallée and Carré O type), but a limited number of additional experiments with three other strains of virus, one of the Waldmann C type, one of the Vallée and Carré A type, and the last of the Vallée and Carré O type yielded similar results.

"It has been found possible to resolve mixtures of the viruses of foot-and-mouth disease and vesicular stomatitis irrespective of their relative concentrations by a method combining filtration with egg inoculation tests. The technic provides a straightforward and relatively economical method of rapidly and accurately distinguishing the two viruses and resolving a mixture of them.

"It is possible, under experimental conditions at least, for an animal to be infected simultaneously with the virus of vesicular stomatitis and the virus of foot-and-mouth disease. Both viruses were passaged together successfully in guinea pigs, and each virus was then recovered in the pure state by the method referred to above.

"A study was made of the relative stabilities of the virus of foot-and-mouth disease and the virus of vesicular stomatitis at different hydrogen-ion concentrations. The results obtained confirmed in general the observations of [G.] Pyl and his coworkers. The virus of foot-and-mouth disease remained infective over a considerable period at 0° C., at about pH 2.5 to 3.5, i. e., under conditions more acid than the generally accepted pH stability limit. The amount of virus which survived within this range pH 2.5 to 3.5, was, however, considerably less than within the zone pH 6.5 to 10. Generally this virus rapidly becomes inactivated within the zone pH 4.5 to 6.2. . . .

"Reasons are given also for the conclusion drawn from experimental observations that no accurate differentiation of the two viruses can be based on Pyl's 'realkalinization' test."

The sizes of the viruses of human and swine influenza as determined by ultrafiltration, W. J. Elford, C. H. Andrewes, and F. F. Tang (*Brit. Jour. Expt. Path., 17 (1936), No. 1, pp. 51–53*).—The viruses of human influenza and swine influenza, as contained in broth suspensions of lung tissue from infected mice, were subjected to differential ultrafiltration through graded collodion (gradocol) membranes with a view to estimating the sizes of the infective agents.

"The end point for each of these strains of influenza virus may be taken as 0.16μ, from which, on the basis of the relationship between limiting porosity and particle size established by Elford (1933) [E. S. R., 74, p. 394], we deduce the probable size of the virus particles to be 80–120 mμ. The virus of influenza

is thus seen to be somewhat smaller than the viruses of vaccinia and herpes (125–175 mμ and 100–150 mμ, respectively).

"The results confirm the earlier conclusion that the diameter of the viruses is less than 0.8μ (Andrewes, Laidlaw, and Smith, 1934 [E. S. R., 74, p. 393]). Further, by showing that they are, in fact, considerably smaller than that figure, they appear to render it extremely improbable that the viruses can represent a small form of *Haemophilus influenzae* or of any other bacterium which has been suggested as a cause of influenza."

A simple method for detecting mastitis streptococci in milk, R. P. Hotis and W. T. Miller (*U. S. Dept. Agr. Circ. 400 (1936), pp. 7, pl. 1*).—A description is given of a simple method for the detection of mastitis streptococci in milk that can be readily used on large numbers of samples and requires comparatively little equipment. The test is designated as the Hotis test in recognition of the work of the late senior author.

"The method consists in adding 0.5 cc of a sterile 0.5-percent aqueous solution of bromocresol purple to 9.5 cc of milk carefully collected directly from the animal. After the sample is mixed it is incubated for 24 hr. at 37.5° C. and the results are observed. A characteristic change in the color of the sample after incubation together with the occurrence of flakes or balls of growth indicates the presence of *S*[*treptoccus*] *agalactiae*.

"Examination of 753 samples of milk by the Hotis test and by the blood-agar method showed the two tests to be in perfect agreement for 715, or 95 percent, of the samples. This figure may be considered an approximate measure of the accuracy of the Hotis test, if the results indicated by the blood-agar plates are assumed to be 100-percent accurate."

The protein changes in ox serum induced by hyperimmunisation against rinderpest virus, M. H. French (*Jour. Compar. Path. and Ther., 49 (1936), No. 3, pp. 226–245*).—The author found that an increase of total protein, total globulin, euglobulin, and globulin insoluble in saturated sodium chloride takes place as a result of intramuscular hyperimmunization of cattle against rinderpest virus. The relative increase of the more insoluble globulins is of the same order as that reported for cattle successfully hyperimmunized by the subcutaneous route. "The changes in the serum proteins of cattle given a massive dose of virulent blood intrarumenally can be as high as those for cattle hyperimmunized intramuscularly or subcutaneously. A large number of animals, however, show changes in the serum proteins no greater than those found in cattle given normal blood or diluted colostrum intrarumenally. When the aqueous extract of pulped virus-containing organs is given intrarumenally, the serum protein changes can be as high as those obtained with intramuscularly hyperimmunized cattle. Individual cases are found, however, in which only a relatively small increase of the euglobulins takes place. The results obtained indicate that in certain cases an increase of the pseudoglobulin proportions may take place, as well as the normal increase of euglobulin as a result of hyperimmunisation. Insofar as globulin increase may be indicative of antibody formation, the results support the view that antiserums made by the intrarumenal method are inferior to those prepared by the more established technics."

The serum protein changes during the immunisation of goats against rinderpest virus, M. H. French (*Jour. Compar. Path. and Ther., 49 (1936), No. 3, pp. 246–250*).—The serum protein changes found to occur during immunizations of goats against rinderpest are reported in tables. "In the goat the serum globulins show a big increase similar to that occurring in the immunization of the ox, but in the goat the pseudoglobulin increase is much more than

that found in the ox, whilst the reverse is true for the euglobulin fraction. The indications are that the antiviral body is spread over a wider serum protein range in the goat than in the ox."

The Vi antigens of various Salmonella types, A. Felix and R. M. Pitt (*Brit. Jour. Expt. Path., 17 (1936), No. 1, pp. 81–86*).—It is concluded from the experiments reported that antigens of the type of the Vi antigen of *S. typhi* also occur in other *Salmonella* species, and there, too, play an important role in infection and immunity.

Vaccination against Salmonella infection, L. de Blieck (*Vet. Rec., 48 (1936), No. 32, pp. 971–974*).—An address presented in London in May 1936.

Comparative studies of the louse-borne (epidemic) and flea-borne (murine) typhus viruses, I. J. Kligler, M. Aschner, and S. Levine (*Brit. Jour. Expt. Path., 17 (1936), No. 1, pp. 53–60*).—Experiments on cross-immunization, as well as those in mice, indicate that typical louse-borne and flea-borne strains of *Rickettsia* can be differentiated both antigenically and biologically. The accumulated evidence supports [C.] Nicolle's[3] view that the two types, though probably having a common origin, are at present distinct.

Carbarsone: Its action on the intestinal trichomonads of rats in vivo, A. Gabaldon (*Amer. Jour. Trop. Med., 16 (1936), No. 5, pp. 621–639*).—In the present paper experiments are reported which establish (1) the minimal curative dose of paracarbaminophenylarsonic acid, to which the name carbarsone has been given, for trichomonad infection in the rat, (2) the differences in this minimal curative dose when the arsenical is administered enterally or parenterally, and (3) the possibility of eradicating the trichomonad infection with a single dose of the medicament. Data are also given on the presence of carbarsone in the intestinal contents and feces of rats, on the minimum time required for a given dose of the drug to kill the flagellates when in the intestine of the host, on the retention time of the arsenical in the intestine of the rats, and on the concentration reached by carbarsone in the contents of the large intestine of these animals.

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—II, Technique, I. W. Parnell (*Canad. Jour. Res., 14 (1936), No. 7, Sect. D, pp. 71–81*).—The standardization of the technic that has been evolved to facilitate the comparative testing of various substances that can be added to manure with the object of effectively destroying the free-living stages of bursate nematodes is described, the methods of controlling the experiments indicated, and the significance of the results discussed (E. S. R., 72, p. 251).

A Br. abortus suspension of uniform agglutinability standardised by means of a dry stable standard anti-abortus serum, A. W. Stableforth (*Jour. Compar. Path. and Ther., 49 (1936), No. 3, pp. 251–262*).—An account is given of a dry standard antiabortus serum prepared by drying the serum of a cow naturally infected with *Brucella abortus* to constant weight over phosphorus pentoxide at low pressures (1 mm or less). The antibody content of this serum was found to be slightly lowered by drying, but afterward remained constant for 2.5 yr. and is expected to remain constant for a much longer period. A description is given of the preparation of a series of suspensions of *B. abortus* of uniform agglutinability standardized exactly by titration with close dilutions of the dried antiabortus serum.

"Thirty-seven batches of suspensions have been prepared in about 2.5 yr. by the same method from the same strain, and little difficulty has been encountered in maintaining the standard agglutinability, i. e., 25-percent agglutination

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[3] Bul. Soc. Path. Exot., 26 (1933), No. 2, pp. 316–340.

with a 1:480 dilution of the reconstructed dried serum. Adjustment of the agglutinability has been made by slight alteration of the opacity of the suspension. This has always been about tube 4 of Brown's series of permanent opacity standards, i. e., about twice the opacity produced by mixing 3 cc of 1 percent barium chloride and 97 cc of 1 percent sulfuric acid. Suspensions keep well at room temperature or in the cold. Some loss of agglutinability occurs during the first 1 or 2 weeks, but suspensions issued 3 to 4 weeks after washing-off can be relied on to maintain their agglutinability practically unaltered for 3 mo. or longer."

Tuberculin reactions in cattle showing no visible tuberculous lesions on postmortem, A. B. CRAWFORD (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 5, pp. 562–583, figs. 2*).—Reference is made to cases in which cattle reacting to the regular test for tuberculosis were found to have been sensitized by avian tubercle bacilli and others by human tubercle bacilli. "An avian type of tubercle bacillus was recovered from one of a group of reacting cattle imported from the island of Guernsey. An experiment in which six cattle were drenched with sputum from human consumptives resulted in three of the cattle developing a reaction to tuberculin. The animal receiving only one drenching developed the strongest reaction.

"The method by which two chromogenic acidfast organisms were recovered indirectly from skin lesions of reacting cattle is described. These organisms were found to be capable of causing subcutaneous swellings in cattle. The sensitization caused by these organisms was found to be stronger for avian than for mammalian tuberculin. A 'tuberculin' prepared from one of these two chromogenic acidfasts was used in field tests in tuberculous cattle and in cattle showing skin lesions only. Of the tuberculous cattle, 11.5 percent reacted to this tuberculin, while 75 percent of skin-lesion cases reacted. Suggestion is made that the skin nodules of cattle are the result of infection with soil acidfast organisms."

The incidence of tuberculosis among 2,270 cattle in four rearing districts in North Wales, R. F. MONTGOMERIE and W. T. ROWLANDS (*Vet. Rec., 48 (1936), No. 32, pp. 961–968*).—In a study of the incidence of bovine tuberculosis in four cattle-rearing districts in North Wales, determined by submitting almost all of the cattle (except calves under 2 mo. old) in each to the double intradermal tuberculin test, 5 percent of the 2,270 cattle on 101 farms reacted. On 57 farms no reactors were detected, and on an additional 15 farms all the home-bred stock were free from infection.

Cl. welchii, type C, Wilsdon (B. paludis McEwen) isolated from sheep in North Wales, R. F. MONTGOMERIE and W. T. ROWLANDS (*Vet. Rec., 48 (1936), No. 27, pp. 829–832*).—A description is given of five cases of atypical strike occurring on two farms in North Wales. "Toxin of the type produced by *Cl[ostridium] welchii*, type C, Wilsdon was demonstrated in certain body fluids from each case. *C. welchii*, type C, Wilsdon (*B[acterium] paludis* McEwen) was isolated from four of the five cases. It would appear that *C. welchii*, type C, Wilsdon may be the cause of sudden deaths among ewes in spring on these two farms, but no good evidence has been obtained to support the possibility of the disease being an enterotoxemia."

The life-history of Psoroptes communis var. ovis, with particular reference to latent or suppressed scab, W. DOWNING (*Jour. Compar. Path. and Ther., 49 (1936), Nos. 2, pp. 163–180, figs. 9; 3, pp. 183–209, figs. 3*).—A study of the biology of the sheep scab mite has shown that under the climatic conditions of Great Britain the life cycle is usually completed in 11 days, with a minimum period of 10 days and a maximum period of 12 days. The duration

of the life cycle, from the first appearance of the larva to the commencement of oviposition, is usually 8 days (maximum 9 days), but, since the male requires from 2.5 to 3 days longer than the female to reach the copulatory stage, unless males of a previous generation are present when the females reach the pubescent stage, the period will be prolonged to 10.5 or 11 days. The number of eggs laid by ovigerous females shows relatively little individual variation, but the rate of oviposition shows considerable variation. The variation in the rate of oviposition appears to be dependent on (1) temperature and possibly humidity and (2) some form of skin reaction inimical to the parasite.

"Sheep which are heavily infected in winter recover spontaneously in the summer. This recovery may be complete, or more frequently is followed by a relapse in the following autumn, the scab having remained latent through the summer. In all such cases acari are continuously present throughout the latent period, whereas in cases of complete recovery the acari have failed to survive the complete latent period. During the summer there is a very marked reduction in the number of reported outbreaks of sheep scab, undoubtedly due to the reduced activities of the acari. Where the infection is contracted in the spring or summer the scab may remain active, but progress is very slow until the autumn. It is possible for sheep to harbor a few acari in the summer without showing any clinical symptoms of the disease.

"In cases of latent scab the most important sites of the body on which acari may be present are the infra-orbital fossae, the inguinal folds, the scrotum of the wether, and the tail. In autumn and winter the acari tend to migrate from these parts to the general body surface. An autumn statutory dipping should, therefore, be more effective against scab than a summer dipping. On sheep in which the scab is latent in the summer the disease becomes active in the autumn, and so a healthy flock may be infected by sheep which are apparently clean when introduced in the late summer. This is the probable explanation for the outbreaks of sheep scab in flocks which have not been in contact with any known source of infection.

"The most favorable time of the year in which to dip sheep for the control of sheep scab is the autumn, when the acari have migrated from the sheltered local sites to the general skin surface of the body."

Nematodes in sheep in Iceland: Experience with carbon tetrachloride drenches, N. DUNGAL and G. GISLASON (*Jour. Comp. Path. and Ther., 49 (1936), No. 3, pp. 210–217*).—Intestinal nematodes of sheep in Iceland have caused severe losses. Of these, *Bunostomum trigonocephalum*, which causes wasting and anemia, and *Chabertia ovina*, which causes severe diarrhea with high mortality, are the most important. In experiments with anthelmintics, carbon tetrachloride has given the best results. Losses resulting from its use have been only 217 sheep out of 300,000.

A study of the intestinal parasites of Icelandic sheep has shown 80 percent to be infested by *Ostertagia circumcincta*, 40 percent by *Nematodirus filicollis*, 36.4 by *B. trigonocephalum*, 52 by *Trichocephalus dispar*, 37 by *Oesophagostomum venulosum*, 46 by *C. ovina*, and 38 percent by *Moniezia expansa*. The numbers of each species found in the course of the survey are recorded in table form.

An organism showing the characters of the genus Sarcocystis present in the central nervous system of the sheep, A. BROWNLEE (*Jour. Compar. Path. and Ther., 49 (1936), No. 3, pp. 263–267, fig. 1*).—A description is given of a cystlike organism found present in the central nervous system of sheep at Midlothian, Scotland. The cysts most resemble those of the genus *Sarcocystis*, and it is tentatively concluded that they are not those of *S. tenella*.

Observations based on weekly parasite egg counts on feces of lambs and yearling sheep, H. MARSH (*Jour. Parasitol., 22 (1936), No. 4, pp. 379–385, figs. 2*).—In the course of work by the Montana Experiment Station, "weekly fecal parasite egg counts were made on a group of 12 lambs from birth in April to December 31 and on 4 yearling sheep from January to December. These counts were supplemented by a series of weekly counts on 3 lambs born in May and by the addition of 4 sheep to the yearling group from June to December. The eggs recorded were those of *Ostertagia circumcincta, Nematodirus spathiger, Moniezia expansa,* and *Trichuris ovis*. Curves recording the average *Ostertagia* egg counts for each group showed in both groups a summer peak, reached in August for the lambs and in September for the yearlings. In each group there was a sharp drop during the month following the peak. In the lambs the earliest appearance of parasite eggs was at the age of 32 days, at which time *Ostertagia* eggs were found in one of the May lambs. *Nematodirus* eggs were observed in one case at 27 days. No *Moniezia* eggs were observed until 141 days after birth."

The susceptibility of swine to the virus of human influenza, R. E. SHOPE and T. FRANCIS, JR. (*Jour. Expt. Med., 64 (1936), No. 5, pp. 791–801, pls. 4*).—In the work here reported, swine inoculated intranasally with human influenza virus alone were found to develop an ill-defined, mild, and usually afebrile illness of short duration. At post mortem the anterior lobes of the lungs of such animals contain scant, scattered areas of lobular atelectasis. Transmission of the virus for five serial passages through two groups of swine failed noticeably to enhance its pathogenicity for this species. The disease produced in swine by infection with human influenza virus alone is indistinguishable clinically and pathologically from that caused by infection with swine influenza virus alone. Transmission of human influenza virus from swine to swine by contact succeeded in only one of four attempts.

Swine inoculated intranasally with a mixture of human influenza virus and *H[emophilus] influenzae suis* usually develop a febrile, depressing illness similar to mild swine influenza. The pneumonia encountered in such animals at autopsy is similar to but less extensive than that seen in swine influenza. In some animals *H. influenzae suis* fails to become established, and the disease then seen is identical with that caused by the human influenza virus alone.

The human influenza virus recovered after five serial transfers in swine was immunologically the same as that with which the experiments were begun.

Brucella suis infection of the brain of swine, G. T. CREECH (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 5, pp. 584–589, figs. 4*).—A report is made of a case in which *B. suis* lesions involved the brain.

The ingestion of the inflammatory exudate by swine lungworms, D. A. PORTER (*Jour. Parasitol., 22 (1936), No. 4, pp. 411, 412, fig. 1*).—It is concluded that since swine lungworms (*Metastrongylus elongatus, M. salmi,* and *Choerostrongylus pudendotectus*) possess only simple lips they are probably incapable of lacerating the tissue and obtaining blood directly. In the light of these observations it appears that the worms ingest the inflammatory exudate and that the ingested red blood cells and leucocytes are merely elements of this exudate.

On agricultural chemical factors leading to anaemic conditions with local occurrence in northern Sweden.—Preliminary report, O. SVANBERG (*Lantbr. Högsk. Ann. [Sweden], 1 (1933–34), pp. 209–250; Eng. abs., pp. 246–248*).—The results of a study of equine infectious anemia, most frequent in northern Sweden, are reported.

Respiratory diseases, I, II, F. R. BEAUDETTE (*New Jersey Stas. Hints to Poultrymen, 23 (1936), Nos. 5, pp. 4; 6, pp. 4*).—A table with the post-mortem

indications that are of use in diagnosing respiratory diseases of poultry is followed by a brief practical summary of information on these affections.

[**Respiratory diseases of poultry**] (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 4, pp. 449, 450*).—The special committee on poultry diseases of the American Veterinary Medical Association, consisting of five members, namely, E. L. Stubbs, chairman, C. A. Brandly, H. J. Stafseth, F. R. Beaudette, and J. R. Beach, suggests the following terminology for the respiratory affections of the fowl: (1) Infectious laryngotracheitis (previously adopted), a virus disease; (2) fowl coryza, a disease primarily of the upper respiratory passages, sometimes involving the head and lower respiratory tract, caused by a specific hemophilic bacillus described by De Blieck in 1932 (E. S. R., 67, p. 170), Nelson (E. S. R., 75, p. 402), and others; and (3) infectious bronchitis, a new disease immunologically distinct from laryngotracheitis, affecting primarily the lower respiratory tract but sometimes involving the respiratory passages of the head, first described by Shalk and Hawn in 1931 (E. S. R., 65, p. 271).

Studies on an uncomplicated coryza of the domestic fowl, VII, VIII, J. B. Nelson (*Jour. Expt. Med., 64 (1936), No. 5, pp. 749–758, pl. 1; pp. 759–769*).—Two contributions are presented in continuation of the studies previously noted (E. S. R., 75, p. 402).

VII. *Cultivation of the coccobacilliform bodies in fertile eggs and in tissue cultures.*—The coccobacilliform bodies of fowl coryza were successfully cultivated in the fetal membranes of fertile eggs. Microscopic examination indicated growth in approximately 50 percent of 94 eggs inoculated on the third to fourth day of incubation. Growth was generally inhibited, however, in eggs inoculated on the tenth day. One strain of the specific bodies was maintained through 11 successive passages in 4-day eggs. A more consistent growth of the coccobacilliform bodies was obtained in tissue cultures. One strain, originally isolated in November 1935, has been carried through 100 successive subcultures at intervals of from 1 to 3 days. The specific bodies fail to maintain their morphological identity for any length of time in this medium. It is noted that growth of the coccobacilliform bodies in fertile eggs and in tissue cultures is not dependent on the presence of living cells.

VIII. *The infectivity of fetal membrane and tissue culture suspensions of the coccobacilliform bodies.*—The fetal membrane and tissue culture suspensions of the coccobacilliform bodies were found infective for normal fowl. Intranasal injection was commonly followed by a coryza which is serially transmissible and communicable by direct contact. The specific bodies are generally demonstrable in the nasal exudate of birds infected either by injection or contact. Compared with the original strain of the coryza of slow onset, the reaction produced by these suspensions is often less vigorous; the incidence of apparent cases, characterized by a nasal discharge, being 97 and 53 percent, respectively. The apparent cases are similarly characterized by a long incubation period and a tendency toward chronicity.

Susceptibility of chickens to tuberculosis following spontaneous exposure to the infection, W. H. Feldman, J. L. Bollman, and F. C. Mann (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 5, pp. 551–561*).—With a view to determining the susceptibility of apparently normal adult chickens to tuberculosis through cohabitation with chickens naturally affected with the disease, a group of 29 nontuberculous chickens were kept in contact for nearly 600 days with 30 chickens which had reacted positively to the tuberculin test. Only 7 of the previously noninfected birds contracted the disease, although tuberculosis was found in 19 of the 30 chickens that were presumably tuberculous when the experiment began.

"The results indicate that, under the conditions of the experiment, the majority of the chickens were capable of withstanding an environmental exposure to tuberculosis for a considerable period without lesions of the disease developing. Repeated or continuous exposure for a prolonged period appears to be necessary before the disease becomes manifest in adult chickens living in an infected environment."

Notes on a minor outbreak of cell inclusion disease, S. J. Gilbert and G. B. Simmins (*Jour. Compar. Path. and Ther., 49 (1936), No. 2, pp. 148–150*).—Reference is made to a minor outbreak of cell inclusion disease that occurred in poultry on farms in the vicinity of Jaffa, Palestine, during a period of a few weeks in June 1935. The mortality on four farms with flocks of from 130 to 200 fowls varied from 3 to 88.5 percent within outbreak periods of from 10 to 32 days. As to its tenacity, it was consistently observed that the virus did not (or very exceptionally) cause the disease if preserved in 50 percent glycerin-saline for more than 10 days.

It is concluded that until better grounds can be found for not separating the disease from plague, it should be referred to as cell inclusion disease.

Fowl plague and Newcastle disease, R. Manninger (*Jour. Compar. Path. and Ther., 49 (1936), No. 3, pp. 279–283*).—The data presented are considered to demonstrate that Newcastle disease and the classical fowl plague represent an etiological unit, although their clinical manifestations differ, particularly in the protracted course of Newcastle disease.

Culex, a new vector of Spirochaeta gallinarum, M. Zuelzer (*Jour. Trop. Med. and Hyg. [London], 39 (1936), No. 17, p. 204*).—In an investigation of an extensive enzootic among fowls in the area of the Baltic Sea, due to *S. gallinarum*, it was shown that mites of the genus *Dermanyssus* are capable of transmitting the disease, but not later than 48 hr. after they have fed on infected fowls. It is pointed out that while the transmission by mites is purely mechanical, experiments with *Culex* mosquitoes as well as with the fowl tick have shown them to be true vectors of fowl spirochetosis.

The treatment of ascariasis in chickens, P. P. Levine (*Cornell Vet., 26 (1936), No. 2, pp. 120–127*).—Experiments conducted in an attempt to evaluate the tobacco dust treatment as a means for controlling roundworms in poultry are reported.

"Tobacco dust (nicotine content 1.78 percent) fed to chicks continuously from the day of hatching, in concentrations of 2, 4, 6, and 8 percent in a dry mash, did not prevent the hatching of embryonated eggs of *A[scaridia] lineata* and the invasion of the intestinal mucosa by the larvae. In 2-percent concentration the tobacco did not show any evidences of toxicity for the chicks. The higher concentrations were toxic. Forty percent of the chicks fed on the 8-percent level died of poisoning.

"There were no significant differences in worm numbers between tobacco treated (2 percent) and control birds fed with the same number of embryonated ascarid eggs until the seventh week of parasitism. Since, in another experiment, it was found that 88 percent of the matnre worms were removed from a group of pullets by such treatment continued for 4 weeks, it would appear that the immature worms are less susceptible to tobacco treatment than adults.

"A nicotine compound (Black Leaf Worm Powder) administered in a single dose removed all of the worms from 45 pullets parasitized with adult worms. This statement, however, should not be interpreted to mean that this treatment will always be 100 percent efficient under all conditions.

"The practice of feeding tobacco dust in the mash continuously to prevent ascarid infection apparently is ineffective. The feeding of the dust for 4 weeks

to older birds for expelling adult worms was less effective than a single treatment with a nicotine powder."

Leucocytozoa and microfilariae of fowls and Haemoproteus columbae of pigeons in Province Wellesley, A. R. KUPPUSAMY (*Indian Vet. Jour., 13 (1936), No. 1, pp. 25–35, pls. 8*).—A report of observations of these blood parasites in Penang and Province Wellesley.

Microfilaria in a duck, F. R. BEAUDETTE (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 5, pp. 589, 590*).—Brief reference is made in this contribution from the New Jersey Experiment Stations to the finding of microfilaria in a wild duck received from a wild fowl refuge on Long Island.

Wildlife disease and population cycles research (In *Wildlife restoration and conservation: Proceedings of the North American Wildlife Conference called by President Franklin D. Roosevelt. Washington: Govt., 1936, pp. 469–493*).—Contributions presented include the following: Progress Report of Wildlife Disease Studies for 1935, by R. G. Green and J. E. Shillinger (pp. 469–471); Discovery of the Organism of Ulcerative Enteritis [*Corynebacterium perdicium* (sic; nom. nud.; see below)], by L. C. Morley and P. W. Wetmore (pp. 471–473); The Lungworm Situation in the White-Tailed Deer (*Odocoileus virginianus borealis*) in Michigan, by E. C. O'Roke (pp. 473–477); Fluctuations in the Population of Bobwhite Quail in the South, by I. N. Kennedy (pp. 481–486); The Prevention of Lead Poisoning in Waterfowl by the Use of Disintegrable Lead Shot, by R. G. Green and R. L. Dowdell (pp. 486–489); Regional Types of Response of Wildlife to the Sunspot Cycle, by R. E. DeLury and J. L. O'Connor (pp. 490, 491); and *Tetrameres crami* Swales 1933, an Important Parasite of Ducks in North America, by W. E. Swales (pp. 491–493) (E. S. R., 69, p. 437; see below).

Tetrameres crami Swales, 1933, a nematode parasite of ducks in Canada: Morphological and biological studies, W. E. SWALES (*Canad. Jour. Res., 14 (1936), No. 10, Sect. D, pp. 151–164, pl. 1, figs. 10*).—This report of a study of a nematode parasite, *T. crami* (E. S. R., 69, p. 437), infesting ducks in Canada includes a description of the male and a redescription of the female. The results of a study of its life history are presented, together with a description of the larval stages. Two fresh-water amphipods, *Gammarus fasciatus* Say and *Hyalella knickerbockeri* (Bate), were found to serve as intermediate hosts. A list of definitive hosts, notes on the ecology of the intermediate hosts and on tetrameriasis crami, and a list of 16 references to literature are included.

The etiology of ulcerative enteritis in upland game birds, L. C. MORLEY and P. W. WETMORE (*Science, 84 (1936), No. 2177, pp. 272, 273*).—The authors report having for the first time so far as known isolated an organism from the liver, spleen, and heart blood of diseased birds that is capable of producing death and typical lesions of ulcerative enteritis (so-called "quail disease"), a highly infectious and rapidly fatal disease that affects most species of native upland game birds (E. S. R., 70, p. 686; 71, p. 396), when fed in pure culture to susceptible quail. In the course of the investigation eight strains of the organism, six from bobwhite quail, one from valley quail, and one from ruffed grouse, were studied. Only slight variations in the morphological and cultural characteristics were noted, although it appears that there may be two or more serological types. A description is given of the characteristics of this organism, to which the name *Corynebacterium perdicum* n. sp. is applied.

"The organism quickly loses its virulence following isolation, and ordinarily most of the strains become nonvirulent when growth is established on culture media. The symptoms, the sudden death, and the character of the lesions asso-

ciated with acute cases of the disease indicate that the organism produces a potent toxin, but thus far we have been unable to demonstrate toxin production.

"Under conditions on game farms there is usually a sudden onset of an epizootic with a large percentage of the birds succumbing in a short time. The disease may entirely subside or it may be followed by an occasional case of chronic infection. It is as a rule difficult to transmit the disease with infective material from a chronically affected individual. Repeated transmission of the disease from one bird to another, under laboratory environment in every instance, has tended to decrease rather than increase the virulence of the infection. All attempts to increase the virulence under natural conditions have failed."

AGRICULTURAL ENGINEERING

Flow of water around 180-degree bends, D. L. Yarnell and S. M. Woodward (*U. S. Dept. Agr., Tech. Bul. 526 (1936), pp. 64, figs. 48*).—This bulletin presents the results of a series of experiments conducted by the U. S. D. A. Bureau of Agricultural Engineering in cooperation with the University of Iowa.

The purpose of the investigation was to explore the laws governing the changes in pressure and velocity in different parts of the flowing stream as the moving water undergoes the transition from motion along a straight path to motion around a curve, and again as it undergoes the opposite transition back to a final straight-line motion. Experiments were conducted on 180° bends of two sizes and two radii. The first series of tests was made on a channel whose cross section was 10 in. square with a 5-in. inner radius. The next series of tests was made on a channel 5 in. wide by 10 in. deep with a 5-in. inner radius. The third series of tests was run on a channel 5 in. wide by 10 in. deep with a 10-in. inner radius.

It was found that a smooth bend acts as an obstruction disturbing the distribution of pressure and velocity in the cross section for a short distance upstream from the beginning of the bend. As water approaches the beginning of a smooth bend, in the outside filaments the pressure always increases and the velocity decreases. In the inside filaments these changes are reversed. As water flows around a bend there must be higher pressure on the outside. With substantially uniform velocity distribution in the approach channel to the bend, the velocities of the filaments along the inside wall of the bend are increased while the velocities of the filaments along the outside wall are reduced. As water flows around a bend the effect of wall friction is to produce an unstable relation between the filaments flowing at different velocities, with the result that the filaments of highest velocity tend through a secondary circulation to drift toward the outer wall of the bend. At the end of the bend there is another rather abrupt rearrangement of pressures and velocities in the cross section whose effects persist for a considerable distance downstream from the bend.

Geophysical prospecting for underground waters in desert areas, F. W. Lee (*U. S. Dept. Int., Bur. Mines, Inform. Circ., 1936, I. C. 6899, pp. 27, figs. 27*).—The purpose of this paper is to describe methods and results of geophysical prospecting for water in Nevada and adjacent States. Discussions also are included of some of the associated problems relating to field technic and geologic interpretations.

The conclusion is drawn that geophysical surveys in Nevada can be used to determine the underground water reserves. It appears that sufficient differences exist in electrical conductivity between the gravel and clay beds to permit successful prospecting for water, especially at shallow depths where the water-

bearing beds are as much as 350 ft. deep. Possible productive territory can be delineated and barren districts excluded.

It was found that considerable increase in speed of field measurements as well as in interpretation is possible with the newer earth-resistivity measuring instruments.

Artificial storing of groundwater by spreading, D. A. Lane (*Jour. Amer. Water Works Assoc., 28 (1936), No. 9, pp. 1240–1251, figs. 2*).—Various methods of storing ground water are described, it being pointed out that water spreading has a definite place in the water supply of the Southwest. Three general methods of spreading, practiced in southern California, are described, including the ditch or furrow method, the use of basins or ponds, and the use of wells or shafts.

Instructions for reservoir sedimentation surveys, H. M. Eakin, rev. by G. C. Dobson and C. B. Brown (*U. S. Dept. Agr., Soil Conserv. Serv., rev., 1936, SCS–SS–2, pp. [1]+36, fig. 1*).—The text of these instructions is presented in detail. It includes sections on general plan of survey; choice of reservoirs; choice of survey methods; range method; contour method; further computations; note keeping, survey monuments; preparation of final reports; and preparation of maps, illustrations, and supplemental material.

Instructions for the construction and installation of the Ramser silt sampler (*U. S. Dept. Agr., Soil Conserv. Serv., [1936], SCS–TP–5, pp. 8, pls. 9*).—The text of these instructions is presented under three parts. Part 1 relates to the silt box, part 2 to the divisor box and storage tank, and part 3 to the drainage of soil surrounding the equipment. Bills of material for the equipment are included, together with working drawings.

A homemade centrifugal pump and other water-lifting devices, O. W. Monson and H. E. Murdock (*Montana Sta. Bul. 324 (1936), pp. 51, figs. 21*).—This bulletin describes equipment for low lifts in pumping water for irrigation where the allowable cost is limited. Several devices are described, but particular attention is given to the homemade centrifugal pump. This pump can be built in a wide range of sizes and has a large capacity at low lifts. A discharge of over 6 cu. ft. per second, or 2,700 gal. per minute, was obtained with a 14-in. pump at a lift of 8.5 ft. in a test made at the station. The pump can be operated with an electric motor, a farm tractor, or a stationary gas engine. Under average conditions the power consumption will be about 0.35 hp. per second-foot per foot lift. The cost of construction is low. The materials for a pump capable of delivering 5 cu. ft. per second at a lift of 10 ft. should not cost more than $30 or $40.

Instructions for the construction and installation of the Parshall measuring flume and Bristol water stage recorder (*U. S. Dept. Agr., Soil Conserv. Serv., [1936], SCS–TP–6, pp. 7, pls. 3*).—The text of these instructions is presented, together with bills of material for the equipment and working drawings.

The arrest and prevention of devastation by floods, G. L. Fuller and H. M. Eakin (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS–MP–12, pp. 11*).—A detailed discussion is given of the subject, as presented before the Connecticut Engineering Congress.

Soil conservation and flood control, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS–MP–11, pp. 14*).—This is an address presented before the Connecticut Engineering Congress on July 25, 1936. It discusses in general the problem of soil conservation and flood control.

Bibliography on soil conservation, compiled by L. H. Wieland, rev. by J. Henderson (*U. S. Dept. Agr., Soil Conserv. Serv., rev., 1936, SCS–MP–10, pp. [V]+179*).—This is the first revision of this bibliography (E. S. R., 74, p. 112).

Proceedings of the International Conference on Soil Mechanics and Foundation Engineering, June 22 to 26, 1936 (*Cambridge, Mass.: Harvard Univ., 1936, vol. 2, pp. 318+[24], figs. [536]*).—This is an extensive publication relating primarily to the engineering features of soil dynamics as they are being investigated in soil mechanics laboratories all over the United States and in many European countries. Numerous reports describing the procedure followed in these laboratories are included, and certain special papers of particular significance are presented on The Influence of Scale-like Shape of Clay Particles on the Process of Shear in Soils, by G. Ter-Stepanian (pp. 112–116); The Influence of the Speed of Loading Increment on the Pressure Void Ratio Diagram of Undisturbed Soil Samples, by K. Langer (pp. 116–120); Shearing Tests, Compressive Tests on Cylinders, Comparison of Results in View of Determining the Angle of Friction and the Settlements in Soils, by M. Buisson (pp. 121–125); A Ring Shearing Apparatus for the Determination of the Shearing Resistance and Plastic Flow of Soils, by M. J. Hvorslev (pp. 125–129); An Investigation of Jürgensen's Squeeze Test, by A. Warlam (pp. 129–133); Progress Report on an Investigation of the Shearing Resistance of Cohesionless Soils, by J. D. Parsons (pp. 133–138); Progress Report on Research on the Consolidation of Fine-Grained Soils, by H. Gray (pp. 138–141); A Rational Method for the Determination of the Vertical Normal Stresses Under Foundations, by W. Steinbrenner (pp. 142, 143); A Method of Representing the Distribution of Stress in Ground, by C. Fischer (p. 144); Influence of Rigidity of a Circular Foundation Slab on the Distribution of Pressures over the Contact Surface, by H. Borowicka (pp. 144–149); The Measurement of Soil Pressures on the Lining of the Midtown Hudson Tunnel, by G. M. Rapp and A. H. Baker (pp. 150–156); Stress Distribution in Elastic Solids, by H. Gray (pp. 157–168); Correlation of Surface Loading Tests With Unconfined Compression Tests for Cohesive Soils, by A. B. Mason (pp. 169–173); Settlement Records and Loading Data for Various Buildings Erected by the Public Works Department, Municipal Council, Shanghai, by N. W. B. Clarke and J. B. Watson (pp. 174–185); Foundation Data, by J. A. Favret (pp. 185, 186); Foundation Soil Testing and Settlement Measuring, by C. Fischer (pp. 186–191); Securing a Vienna Tenement House Against Injurious Settlement by Reducing the Soil Pressure and Draining the Underground, by R. Tillmann (pp. 191–193); The Stability of Foundations of Embankments, by L. Jürgenson (pp. 194–200); Stability of Earth Slopes by J. Jáky (pp. 200–207); Conditions for the Stability of Piles, by B. M. Lozovsky (pp. 208–211); Dynamic Formula for Determining the Resistance of Piles, by B. M. Lozovsky (pp. 212–216); Notes on the Pile Driving Formula Included in the Proposed Boston Building Code, by J. S. Crandall (pp. 216–220); Pile-Driving and Test-Loading Records, by N. W. B. Clarke and J. B. Watson (pp. 221–227); Load Test on a Wood Pile Driven Into the Ground, by R. Tillmann (pp. 227–229); Relation Between Relative Density and Earth Pressure, by H. Petermann (pp. 254, 255); Observations of the Texas State Highway Department on the Subsequent Effects of the Uniformity and the Non-uniformity of Foundation Soil-Types on Pavements and Also the Effects of Uniformity and Non-uniformity of Moisture Content Fluctuations in Soil Foundations of High Volumetric Change, by H. C. Porter (pp. 256–260); Progress Report on an Investigation of Frost Action in Soils, by A. Mackintosh (pp. 260–262); Soil Consolidation Works Effected Near Elne, France, on a Bridge Over the Tech River, by P. Bachy (p. 263); Principles Governing Interpretation of Results Obtained Through Exploration of Soils for Foundation Purposes, by J. M. Abeleff (pp. 280–282); About the Protection of Structures From the Existence of Radiating Elastic Waves in the Soil, by D. D. Barkan (pp. 283, 284); Field Investigations of the Theory of Vibration of Massive Foundation

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Under Machines, by D. D. Barkan (pp. 285–288); A Method of Determining the Rate of Deformation in Soil Mass by Means of Electricity, by G. I. Pokrowski (pp. 289, 290); Consolidation of Marine Clay, by O. K. Froehlich (pp. 290–294); Pretest Shoring of Retaining Wall, by H. T. Immerman (pp. 294–296); and Experiments With Models for Determining the Deformation and Tensions in Foundations on Plastic Ground, by A. Pogány (pp. 298, 299).

No mention is made in this voluminous report of the work in soil dynamics which has been conducted at several of the State agricultural experiment stations.

The physical properties of clay soils and some aspects of their mechanical behaviour, L. F. Cooling (*Jour. Soc. Chem. Indus., Trans., 55 (1936), No. 2, pp. 25–31, figs. 7*).—The dynamic properties of clay soils are discussed, with particular reference to their use in road building and as foundations for buildings. Special attention is devoted to the properties of compressibility, resistance to lateral movement, and influence of structure.

Electrolytic measurement of the corrosiveness of soils, I. A. Denison (*Jour. Res. Natl. Bur. Standards [U. S.], 17 (1936), No. 3, pp. 363–387, figs. 12*).—The electrolytic behavior of steel in contact with 47 soils of known corrosiveness was studied by means of a cell in which both electrodes were steel and the electrolyte was moist soil. By providing differential aeration of the electrodes the cell was enabled to develop its own electromotive force. Measurements were made of the voltage, current, and resistance of such cells. The relation between the current density and applied voltage was also studied. The losses in weight of the test specimens were related to the average current density over a certain range of applied voltage and to the total quantity of electricity produced in the corrosion process. The corrosion of the specimens in the laboratory tests was correlated with corrosion experienced in long-time field tests. The results of the tests may be applied practically in predicting the corrosiveness of soils toward iron and steel, but not to the prediction of leaks or to the estimation of the useful life of a section of pipe line until the relations connecting depth of pitting with exposed area and time can be established.

Management and use of agricultural lands including farm woods and pastures, H. H. Bennett (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS–MP–13, pp. 39, pls. 10*).—This paper, which was presented at the Upstream Engineering Conference (E. S. R., 75, p. 577), deals with the subject from the standpoint of soil conservation and erosion control, with special reference to its mechanical features.

Public Roads, [October 1936] (*U. S. Dept. Agr., Public Roads, 17 (1936), No. 8, pp. 175–202+[1], figs. 14*).—This number of this periodical contains data on the status of various highway projects receiving Federal funds as of September 30, 1936; data on the disposition of State motor carrier, motor fuel, and motor vehicle receipts, and receipts from State imposts on highway users, 1934; and the second installment of part 4 of an article on The Structural Design of Concrete Pavements, by L. W. Teller and E. C. Sutherland (E. S. R., 76, p. 253).

Plain concrete, E. E. Bauer (*New York and London: McGraw-Hill Book Co., 1936, 2. ed., pp. XIII+364, pl. 1, figs. 147*).—This is the second edition of this book (E. S. R., 60, p. 779), in which nearly all the material has been rewritten and many new illustrations added.

The information presented on special cements has been enlarged to include the recent developments and increased knowledge of the action of cement in the setting and hardening processes. The theories of proportioning are pre-

sented in a separate chapter and illustrative procedures have been included. The chapter on estimating has been rewritten and incorporated as a chapter on applied proportioning immediately following the one on theories. In this chapter are included new curves showing for present-day cements the relationship between strength and (1) water-cement ratio, (2) cement-space ratio, and (3) cement-water ratio. A complete set of computations illustrating the figuring or quantities of materials for making concrete are shown. In the chapter on the factors affecting concrete strengths, new curves for present-day cements have been given for age-strength relationship for standard cements and a special cement. Results of recent tests of the effect of low temperatures are also given. Available data on the effect of vibration of concrete are given in the chapter on placing, finishing, and curing of concrete. A section on durability is included in the chapter with workability and waterproofing. Specifications of the American Society for Testing Materials for ready-mixed concrete and for concrete for pavements are quoted in full, and instructions for the performance of the various tests have been revised to include its latest revisions.

Decay in structural timbers, E. A. RUDGE and H. LEWIS (*Jour. Soc. Chem. Indus., Trans., 54 (1935), No. 46, pp. 385T–387T, fig. 1*).—In studies of dry rot in a skirting board removed from a modern dwelling house, it was concluded that the extent of decay, as evaluated by chemical methods, is dependent upon the amount of iron and calcium compounds filtering into the tissue. The opinion is expressed that fungus growth cannot be held responsible for the full extent of chemical breakdown, and this example is considered representative of the majority of instances of similar decay.

The results indicate that careful attention should be given to the damp coursing in structures where timber is to be employed in order to remove the source of ions concerned in inorganic decay. Unprotected wood should not be fixed to lime-plaster surfaces, since these, under suitable conditions, are conducive to the formation of the inorganic ions concerned in the decay.

The prevalent system of fixing timbering to wooden plugs by means of iron nails is to be deprecated, since it is shown that this method provides a favorable route for infiltration and a potential source of iron compounds. The well-recognized harmful effect of iron, which may be due to a process of catalytic oxidation, should be avoided by the use of copper or galvanized nails.

The selection, preservation, distribution, and identification of Australian pole timbers, J. E. CUMMINS and H. E. DADSWELL (*Austral. Council Sci. and Indus. Res. Pam., 55 (1935), pp. 79, pls. 7*).—This technical paper gives the results of a recent survey of present practices of users of poles in Australia, and includes statistics on the number, size, classes, average cost, renewals, and annual extensions of poles throughout Australia. The various factors, such as termites and decay, affecting the life of poles, and those features likely to occur in a pole and which may affect its service life are discussed, and a description of the most important methods of pole preservation and their probable relative economy are given. In order to assist pole users, a general description of the timbers used for poles and of their distribution and keys for their identification are included.

Thermal and physical properties of fuel briquettes made from agricultural and other waste products, J. B. RODGERS (*Agr. Engin., 17 (1936), No. 5, pp. 199–204, figs. 7*).—Studies conducted at the Idaho Experiment Station on the briquetting of farm waste materials with a high pressure commercial machine are reported. The machine was designed originally to utilize dry lumber waste products.

The machine handled agricultural waste products as satisfactorily as lumber wastes. Boiler tests showed that, in general, the heating value of briquets made from shells and pits is higher than that of briquets made from straw. The heating value of straw briquets averages several hundred B. t. u. per pound less than briquets made of wood. The burning characteristics of wheat straw briquets more nearly approximate those of coal than briquets made of wood. Wheat straw briquets do not disintegrate as readily as wood briquets in the furnace or stove, but maintain their original form a greater length of time, more nearly as a lump of coal would do under similar conditions. Under the conditions of the boiler tests run, wheat straw fuel gave the highest boiler efficiency of any of the fuels tested.

No difficulty was experienced in making briquets from straw unless the moisture content of the straw exceeded 10 percent. When the moisture content of the raw material is excessive, the heat of compression generates sufficient steam and gas to cause small explosions in the dies as the material is being formed into briquets. This causes the surface of the briquet to be rough, and in general lowers its quality. If the moisture content of the raw material is lowered by drying to approximately 8 percent, no difficulty is experienced.

With one exception, the briquets made from agricultural waste products withstood a greater compressive load before failing than did the briquets made from dry lumber wastes. In general, it is considered safe to say that briquets made from straw are superior to those made from planer shavings on the basis of the quality of the bond. Briquets made from agricultural wastes do not crumble or break as easily as briquets made from wood waste, giving the former a decided advantage from the standpoint of handling and storing. Briquets should be stored in a dry place as moisture weakens the bond, causing them to lose their original form. Briquets have been stored in cellars for weeks without seriously weakening the bond or causing any appreciable crumbling; however, the direct application of even a small amount of water, as, for example, a drip from a leaky roof, quickly causes a briquet to crumble and fall apart.

Briquets made from almond shells, peach pits, apricot pits, peat, newspapers, and coal have a very weak bond, crumble easily, and cannot be handled or stored with the same ease as other briquets.

Measuring apparatus for the testing of agricultural machinery used by the Montana Agricultural Experiment Station, H. E. Murdock (*2. Cong. Internatl. Génie Rural, Madrid, 1935, Organ. et Raps., pp. 275–284, figs. 13; Fr. abs., p. 284*).—In a brief contribution from the station this equipment is described and illustrated.

Improvement of farm machines, J. B. Davidson (*2. Cong. Internatl. Génie Rural, Madrid, 1935, Organ. et Raps., pp. 365–372, fig. 1; Fr. abs., p. 372*).—This presents the results of an investigation of the status of 25 farm machines in general use and manufactured during the period 1910–14, as compared with that of similar machines manufactured in 1932. The quality index number of farm machines in 1932 as compared with farm machines in 1910–14 varied from 130 to 215.

Tests of farm tractors under field conditions, H. E. Murdock (*2. Cong. Internatl. Génie Rural, Madrid, 1935, Organ. et Raps., pp. 287–294, figs. 7; Fr. abs., pp. 293, 294*).—In a brief contribution from the Montana Experiment Station, results of seven seasons of tests of farm tractors under field conditions are briefly summarized. These have related particularly to the effect of useful drawbar horsepower on fuel consumption, use of distillate, effect of carburetor setting, effect of gear on fuel consumption, and effect of drawbar pull on speed and power.

Data are presented to show that the fuel consumption per hour of a gasoline tractor varies directly with the horsepower, and that the fuel consumption per horsepower hour decreases with the power. Data on the use of distillate showed that the fuel consumption is practically the same as with gasoline.

It was found that drawbar pull has more effect on slip of drivewheels than any other factor.

A resume of comparative studies of low pressure pneumatic tires for farm tractors and farm equipment in the United States, G. W. McCuen and E. A. Silver (*2. Cong. Internatl. Génie Rural, Madrid, 1935, Organ. et Raps., pp. 240–264, figs. 21; Fr. abs., pp. 263, 264*).—In this contribution from the Ohio Experiment Station, experience at 12 other experiment stations on the use of low-pressure pneumatic tires on farm tractors is reviewed and experiments at the Ohio Station (E. S. R., 74, p. 706) noted.

Performance studies of small combines, W. M. Hurst and W. R. Humphries (*Agr. Engin., 17 (1936), No. 6, pp. 249, 250, fig. 1*).—Investigations conducted by the U. S. D. A. Bureau of Agricultural Engineering in cooperation with the Illinois, Indiana, and Mississippi Experiment Stations are reported. Field observations and tests of combines were made, results of which indicate crop, field, and weather conditions; setting and speed of salient parts of the machines; and threshing and field losses for small grain and soybeans in Illinois and for soybeans in the Mississippi Delta.

No evidence was secured indicating a relation between the width of cut of a combine and threshing losses or quality of the threshed grain. Adjustments and condition of the crop were found to influence threshing losses and quality of the grain to a greater extent than the size or type of combine. The quantity of threshed grain thrown over with the straw is usually higher than the unthreshed grain with both small and large machines. A 2-plow tractor in good mechanical condition seemed to have no difficulty in operating a power take-off combine with a cutter-bar width of about 5 ft., at ground speeds up to 5 miles per hour, the maximum speed of machines on which observations were made. Small combines on which observations were made could be operated successfully at a speed of 5 miles per hour when crop and field conditions were favorable, but frequently threw over an excessive quantity of threshed grain with the straw at such speeds when badly lodged and weedy fields were encountered. Due to small size, light weight, and use of pneumatic tires the small machines could be moved from field to field or to distant points expeditiously.

Farm electric milk cooler with pneumatic agitation, J. E. Nicholas (*Agr. Engin., 17 (1936), No. 7, pp. 281–283, figs. 7*).—In a brief contribution from the Pennsylvania Experiment Station a motor-driven milk cooler developed at the station is described, and service tests are reported. The compressor power unit is mounted on the right-hand side of the milk cooler cover. A unique feature is the pneumatic agitator used for circulating the milk cooling water during the first 2 hr. of cooling. This agitator is a rotary air compressor operated from the end of the motor armature shaft of the refrigerating power unit.

The refrigerating capacity of the unit is 2,700 B. t. u. per hour as determined by the rate of cooling 160 gal. of water in a 77° room temperature. To cool 160 gal. of water from 60.1° to 35° required 12.5 hr. and an expenditure of energy of 9.24 kw.-hr. with the agitator in operation. Without agitation the cooling would have required but 8 kw.-hr. Energy supplied to the motor at 3-lb. suction and 69-lb. discharge pressures in 77° room temperature, as measured by a portable rapid meter, was 740 and 640 w with and without agitation, respectively. A cupful of water will maintain the agitator in operation for 2.25 hr. Milk of 90° initial temperature cools to 50° in 0.75 hr. or to 42° at the end of

the first hour. The total time the machine operated was 20 hr. and 18 min. to cool 115 gal. from 90° to 34°. This included the morning and evening milk. Total energy used was 12.45 kw.-hr. The cooling water never exceeds 34° when six cans of 90° milk are placed to cool at one time, and only half of the available ice was used up at each cooling.

The ice bank provides sufficient refrigeration capacity to hold the cooling media at 33° during the cooling process. A water-to-milk ratio of $R=1.65$ is sufficient under these conditions.

Brown type multistage walnut dehydrator, B. D. MOSES (*Agr. Engin., 17 (1936), No. 7, pp. 297, 298, figs. 3*).—In a brief contribution from the California Experiment Station, service experienced with this dehydrator is described.

Determining the tonnage of hay in long stacks and round stacks, F. B. HEADLEY (*Nevada Sta. Bul. 143 (1936), pp. 14, figs. 7*).—Mechanical and graphic data are presented on the subject, based on Nevada conditions.

The common storage: Its construction and management, D. COMIN (*Ohio Sta. Bul. 573 (1936), pp. 49, figs. 15*).—This bulletin discusses the principles of construction and management of air-cooled storages, as well as materials for insulation, on the basis of results with an experimental storage and with commercial storages over the State. The discussion relates particularly to factors affecting the quality of stored fruit, the principles of common storage, and engineering factors involved in the construction, insulation, and ventilation of the storage. A section also is included on the remodeling of farm structures for storage purposes.

Air conditioning and engineering (*Detroit: Amer. Blower Corp., 1935, Sect. I, pp. [IX]+359, figs. 275*).—This is a treatise on the technic of conditioning and mechanical movement of air for the health and comfort of human beings. It contains chapters on air, heat and steam, air flow, air ducts, fans, power selection for fan drive, sound, ventilation, heating, unit heat and unit ventilators, humidifying, cooling and dehumidifying, refrigeration, temperature and humidity control, vapor absorption and removal, drying, ceramics, furnaces, mechanical draft, fume collection and removal, dust collection and pneumatic conveying, mine ventilation, and tables and conversion factors.

Rock wool in relation to health, L. T. FAIRHALL, S. H. WEBSTER, and G. A. BENNETT (*Jour. Indus. Hyg., 17 (1935), No. 6, pp. 263–275, figs. 5*).—Studies conducted at Harvard University indicate that no hygienic hazard exists in contact with commercial rock wool used for insulating purposes. Histological examination of the lungs, liver, and kidneys of experimental animals revealed no constant or significant pathological changes. In cats exposed to the dust from rock wool there was evidence of inhalation of considerable quantities of silicate, and the accompanying changes in the lungs were those which one might expect such foreign matter to produce.

AGRICULTURAL ECONOMICS

Significant figures in statistical constants, E. B. ROESSLER (*Science, 84 (1936), No. 2178, pp. 290, 291*).—"Since the errors of measurement are ordinarily tremendously greater in biological, economic, and social investigations than in physical observations, the retention of more than one doubtful figure in a constant is unjustified. Therefore, when final results are published, the second doubtful figure should be dropped and the constants expressed to the figure that corresponds with the first significant figure of their respective precision measures. In all other data, and in computations, retain as many places of figures as correspond to the second place of significant figures in the

pertinent deviation or precision measure. Two places of doubtful figures are thus retained so that accumulated errors due to rejections in the course of a computation may not affect the first place of uncertain figures in the result.

"Many workers in the social and biological sciences are not mathematicians and use statistical analysis only as a necessary tool. For these, a definite, simple, yet mathematically sound rule is desirable. The writer suggests the following working rule: In a final published constant retain no figures beyond the position of the first significant figure in the standard error; keep one more place in all computations."

Covariance used to analyze the relation between corn yield and acreage, G. M. Cox and G. W. Snedecor (*Jour. Farm Econ., 18 (1936), No. 3, pp. 597–607, fig. 1*).—The use of analysis of covariance is illustrated in a study of the relation between corn yield and corn acreage within and between the seven types-of-farming areas in Iowa in 1933. The findings in the study were as follows:

"The relationships are quantitatively small. In the northern cash grain area a significant negative correlation is interpreted as indicating decreased fertility on farms where corn is raised so persistently as to impair fertility. In the south central pasture area the significant positive correlation reflects the tendency for operators of small farms to keep land in corn despite the effects of erosion. In the other five areas of the State there is little relation between corn acreage and corn yield. There is a highly significant difference in the mean area corn yields of the seven type-of-farming areas. In this 1933 sample, the north central cash grain farms had a larger average corn yield than the other areas."

[Papers presented at the twenty-sixth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 18 (1936), No. 3, pp. 453–507*).—Papers in addition to those previously noted (E. S. R., 75, p. 554) are included as follows: Production Control in Agriculture and Industry, by M. R. Benedict (pp. 453–468); Agricultural Adjustment and Farm Tenure, by D. W. Watkins (pp. 469–476); Rural Zoning: Controlling Land Utilization Under the Police Power, by C. I. Hendrickson (pp. 477–492); Migration Required for Best Land Use, by B. W. Allin (pp. 493–499); and Planning Location of Hard Roads and Electric Lines, by T. E. LaMont (pp. 500–507).

[Papers and notes on agricultural economics] (*Jour. Farm Econ., 18 (1936), No. 3, pp. 508–522, 533–596, 608–621*).—Included in addition to the papers noted above are articles and notes as follows: Enactment and Administration of Rural County Zoning Ordinances, by G. S. Wehrwein (pp. 508–522); Land Utilization in Nova Scotia, by W. V. Longley (pp. 533–542); Irrigation Policies and Programs in the Northern Great Plains Region, by S. E. Johnson (pp. 543–555); Argentine Experience With Farm Relief Measures, by S. G. Hanson (pp. 556–567); Mortgage Adjustment and the Re-organization of Farm Finance in New Zealand, by H. Belshaw (pp. 568–586); Cotton Gins as Public Utilities in Oklahoma, by R. A. Ballinger (pp. 587–596); Farm Credit Research in the FCA, by W. G. Murray (pp. 608–610); The 1936 Agricultural Census of the Provinces of Manitoba, Saskatchewan, and Alberta, by O. A. Lemieux (pp. 610–612); Economic Status of Tenure Groups in Tallapoosa and Chambers Counties, Alabama, by B. F. Alvord (p. 613–616); and A Review of the Oleomargarine Situation, by H. Trelogan (p. 616–621).

Proceedings of the seventh annual meeting of the Canadian Society of Agricultural Economics, Edmonton, Alta., 1935 (*[Ottawa], 1935, pp. [2]+102*).—This is a continuation of the series previously noted (E. S. R., 74, p. 866) and includes the following papers presented at the meeting held at the University of Alberta, June 25–27, 1935: An Agricultural Policy, by W. V. Longley

(pp. 3–14); Production Trends and Policies, by T. W. Grindley (pp. 14–22); Land Utilization Policy With Particular Reference to Western Canada, by W. Allen (pp. 23–31), and discussion by G. H. Craig (pp. 32–35); Farm Indebtedness, by E. C. Hope (pp. 36–44); Farm Mortgage Situation: Land Appraisal Aspects, by H. C. Grant and M. Brock (pp. 45–52); Some Changes in Live Stock Marketing, by B. N. Arnason (pp. 53–69); Milk Marketing Legislation in Canada, by C. V. Parker and H. R. Hare (pp. 70–81), with discussion by C. A. Lyndon (pp. 82–84); and An Apraisal of Present Policies and Glimpse of the Future, by J. E. Lattimer (p. 85–98).

Current Farm Economics, Oklahoma, [October 1936] (*Oklahoma Sta., Cur. Farm Econ., 9 (1936), No. 5, pp. 105–125, figs. 3*).—Included besides the usual tables of price indexes in the United States and Oklahoma, demand deposits, and purchasing power of Oklahoma farm products are articles on Effect of 1936 Drouth on Oklahoma Farmers, by H. A. Miles and J. M. Ives (pp. 107–109); The Oklahoma Farm Price of Cotton Is Closely Related to the Price of Futures at New York, by T. R. Hedges (pp. 109–112); Seasonal Aspects of Oklahoma Hogs Prices and Marketing, by A. W. Jacob (pp. 120–122); Cotton Situation, by C. B. Barre (pp. 113–116); Wheat Situation, by A. L. Larson (pp. 117–119); and the Agricultural Situation (p. 123).

Elements of farm management, J. A. Hopkins (*New York: Prentice-Hall, 1936, pp. XVII+390, figs. 71*).—This textbook "does not attempt to cover the entire field of production economics, but confines itself to a small number of fundamental principles. . . . The farm is treated as a going concern—as it appears to the student who is living on a farm while he is studying farm management. The elementary student is not likely to be greatly interested in principles as such. Consequently, this book is not organized, primarily, around the abstract principles. Instead, they are presented as interest in them would naturally arise in practical problems of farm operation."

Some relationships of the farm organization to the external business world are discussed. Farm records are suggested and described in connection with the discussion of crop plans, livestock enterprises, etc.

The material is presented in chapters on economic activity and choosing an occupation, types of farming, specialization or diversification, obtaining the use of a farm, organizing the farm and the farmer's resources, budgeting and planning, the principle of diminishing physical output, the principle of diminishing economic returns, selection of the crops, major and minor rotations and crop records, requirements in crop production, purposes of livestock in the farm organization, the feed supply and the livestock system, budgeting for the livestock system, the field layout, selecting equipment to economize labor, selecting the type of power—horses or tractor, budgeting for general expenses, records to check up on farm performance, making efficient use of labor, checking up on performance—use of records, modifying the budget and allowing for price change, cooperation in current farm management, financing the farm business, and the farmer's market contacts. These chapters are followed by a list of references.

The farm real estate situation, 1935–36, B. R. Stauber and M. M. Regan (*U. S. Dept. Agr. Circ. 417 (1936), pp. 40, figs. 7*).—This is a continuation of the study previously noted (E. S. R., 75, p. 122).

"The farm real estate situation during the year 1935–36 has been characterized by the continuation of the trend toward higher farm real estate values, more voluntary transfers and trades, and a smaller number of forced transfers occasioned by delinquency upon farm-mortgage indebtedness or farm real estate taxes. The refinancing and other emergency activities of the Farm

Credit Administration have continued to recede in importance, and to begin to give way to the more permanent problems of farm-mortgage credit. Although the decline in foreclosure rates has not been uniform, increases having occurred in a number of States, although many farmers are still facing acute distress, and although it appears unlikely that there has been a substantial decrease in the landholdings of creditor agencies, the tone of the farm real estate market has improved considerably and gives increasing evidence of regained confidence in farm real estate."

An approach to the grading of land for purposes of appraisal, C. H. Hammar (*Jour. Farm Econ., 18 (1936), No. 3, pp. 523–532, figs. 6*).—The approach discussed in this contribution from the Missouri Experiment Station is that of the use of unit soil factors previously described more fully in Missouri Station Research Bulletin 229 (E. S. R., 74, p. 870). The findings in a study of the relationship between surface soil nitrogen and readily available phosphorus and crop yield index and average county land value per acre in Missouri are shown and discussed. The relationships for clay hardpans and topography are noted. The advantages and limitations of the system are described.

Studies of probable net farm revenues for the principal soil types of Saskatchewan on the basis of their past production, W. Allen, E. C. Hope, and F. C. Hitchcock (*Saskatchewan Univ., Col. Agr. Ext. Bul. 64 (1935), pp. 38, fig. 1*).—"It is the purpose of this report to present conservative estimates of the costs likely to be incurred in farming in areas typical of the Province, and of the revenues that may be expected from farms of representative sizes in these areas during the next decade." Operating statements, including tables showing utilization of land, livestock and livestock products, farm receipts, possible debt amortization, farm living expenses (cash), farm expenses (cash), summary of receipts, expenses, and net income, and average grain yields, are given for 320- and 640-acre farms operated with horses on the 11 principal soil types of the Province and for 1,280-acre farms operated mechanically on fair and the best prairie soils.

Studies of farm indebtedness and financial progress of Saskatchewan farmers.—Report Nos. 1–4 (*Saskatchewan Univ., Col. Agr. Ext. Buls. 60 (1934), pp. 50, figs. 2; 65 (1935), pp. 58, figs. 2; 68 (1935), pp. 53, figs. 2; 71 (1936), pp. 47, figs. 2*).—This series of bulletins present the findings in surveys made in a program of research in farm indebtedness and financial progress of farmers in areas representative of important types of farming in Saskatchewan.

No. 1, by W. Allen, deals with Rosemount and Reford; No. 2, by W. Allen, E. C. Hope, and I. S. McArthur, with Brokenshell, Wellington, and Scott; No. 3, by W. Allen, E. C. Hope, and F. C. Hitchcock, with Indian Head and Balcarres, Grenfell and Wolseley, and Neudorf and Lemberg; and No. 4, by W. Allen, E. C. Hope, and H. Van Vliet, with Lakeside, Leroy, Wolverine, Spalding, St. Peter, and Humboldt. Each bulletin describes the area and its settlement, land tenure, land utilization, farm capital, livestock, farm revenues, operating costs, balance of income and credit received and expenditures, changes in farm inventory, progress toward ownership, progress made in paying for land, record of crop production, farm indebtedness, changes in average indebtedness, 1930–34, study of selected farms, etc.

Farmer bankruptcies, 1898–1935, D. L. Wickens (*U. S. Dept. Agr. Circ. 414 (1936), pp. 32, figs. 4*).—Analysis is made of the number of farmer bankruptcies for the years ended June 30, 1899 to 1935, by States and geographic divisions, and comparisons are made with a number of bankruptcies in other occupations. The relation of farmer bankruptcies to economic conditions, their

lag behind economic changes, the effect of the lag on legislation, the exemptions under different State laws, time required to dispose of farmer bankruptcy cases, costs of bankruptcy proceedings, the average assets and liabilities, etc., are discussed. The provisions for and experience with adjustment of farm debt distress by composition and extension under the National Bankruptcy Act are discussed.

Trends and desirable adjustments in Washington agriculture, A. E. ORR, C. P. HEISIG, J. C. KNOTT, and C. L. VINCENT (*Washington Sta. Bul. 335 (1936), pp. 45, figs. 5*).—This bulletin summarizes the reports prepared during the spring and summer of 1935 by committees from the State College of Washington and the station as part of the program of the cooperative study of agricultural conditions, trends, and possible adjustments carried on by the U. S. Department of Agriculture and the experiment stations of the several States. Wheat, livestock and livestock products, tree fruits, small fruits, and vegetables are discussed.

The investigations reported on were conducted partly on the basis of type-of-farming areas and partly on the basis of commodities produced. Data were assembled from the station, U. S. D. A. Soil Conservation Service, Federal Census, and publications of the U. S. Department of Agriculture. Expressions of farmers, ranchers, other businessmen, and extension agents were used in determining the recommended adjustments in the agriculture of Washington. The committee reports summarized in this bulletin were used as the main source of factual material for county program planning meetings held in 38 of the 39 counties of the State in February and March 1936 by the agricultural extension service.

The world agricultural situation in 1933–34 (*Roma: Internatl. Inst. Agr., 1935, pp. VIII+502*).—This economic commentary on the International Yearbook of Agricultural Statistics for 1933–34 noted on page 415 is the fifth in the series previously noted (E. S. R., 72, p. 267). Part 1, world agriculture (pp. 3–117), discusses the conditions and trends in world agriculture in 1933–34 in sections on national planning and world economy, the problem of coordination, and agricultural planning and prices. It also summarizes the position and tendencies during the year of the international market for cereals, sugar, coffee, tea, cacao, wine, grapes, olive oil, tobacco, textile materials, and livestock and livestock products. Part 2, agricultural policy and conditions in the different countries (pp. 121–502), describes for each of the several countries the government measures for farm relief and discusses the economic conditions of agriculture. The information on the action of voluntary organizations in the interests of producers, included in previous issues, is omitted.

Measures of major importance enacted by the 74th Congress, January 3 to August 26, 1935, and January 3 to June 20, 1936, compiled by V. H. FISCHER (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 66 (1936), pp. IV+209*).—This list is similar to that previously noted (E. S. R., 72, p. 711). It includes (1) most of the more important laws enacted by the 74th Congress; (2) some of the more important proclamations of the President and Executive orders up to March 5 and 18, 1936, respectively, and a few later proclamations and Executive orders; and (3) some less important laws and resolutions of special interest to the Bureau of Agricultural Economics. Congressional hearings are noted insofar as information could be readily obtained.

Receipts and expenditures of 876 New York towns in 1934, M. P. CATHERWOOD (*[New York] Cornell Sta. Bul. 659 (1936), pp. 50, fig. 1*).—"This study presents an analysis of receipts and expenditures in 1934 for the 876 New York towns with a population of less than 10,000 outside the 4 counties

of Nassau, Rockland, Suffolk, and Westchester." Town government in New York and the fiscal practices of towns are described. Tables show the average receipts by sources and expenditures by types for the 876 towns. Analysis is made of the relation to variations in receipts and expenditures of population per town, density of population, population per town and density of population, and density of population and taxable property per capita, and also of the variation in receipts and expenditures for highway purposes.

Of the receipts of the 876 towns, 63.5 percent came from the property tax (35.3 percent for highway items and 28.2 for the general fund), 30.3 percent from State aid and shared revenues, and 6.2 percent from other income and borrowing. Of the town expenditures, approximately 50 percent were for highways, 22 percent for welfare, 8 percent for debt service, and 20 percent for other expenditures, the most important of which were those for assessment, elections, and the offices of supervisor, clerk, and justices.

"Such factors as density of population and taxable property bear a pronounced relation to variations in expenditures and to the proportion that various expenditures are of the total. These relationships suggest that in New York towns, area alone, as a factor influencing expenditures, is less important than such factors as density of population and taxable wealth. To place the entire emphasis on geographic size in considering the problems of town government is to neglect the fields of improved administration, the possible transfer of certain functions to other units, and the development of an improved program of State assistance for local government."

Variations in town taxes in New York, M. P. Catherwood ([*New York*] *Cornell Sta. Bul. 658 (1936), pp. 43*).—"This report deals with limited phases of one of the problems of government in New York. It includes an analysis of the trend in town and special district taxes from 1900 to 1934 and a study of variations in town taxes in the year 1934. As a basis for this analysis, a brief description of taxation and of town government is included." School, county, and village taxes levied against property in towns are not included in the analysis, which covers 932 towns.

"Town and special district taxes per town were approximately 10 times as high in 1934 as in 1900. The most important factor influencing this average trend has been the increased governmental services performed by towns. . . . In general, taxes increased from 5 to 8 times in towns with relatively small changes in population. In towns with large decreases in population, taxes increased less rapidly. In groups of towns with large increases in population, taxes increased as much as 30 or 40 times. . . . Taxes increased more rapidly in those towns with large amounts of taxable property per capita than in those with less. The most rapid increases occurred in the towns in which population increased rapidly and which also had relatively large amounts of taxable property. Approximately 70 percent of the special district taxes are levied in the 14 towns with a population of more than 20,000. Special district taxes per town, per capita, and in relation to town taxes are much higher in the large towns than in those with a small population. The most important factors influencing variations in taxes per capita in 1934 were the density of population and the taxable property per capita. Taxes per capita declined as density of population increased, when towns with similar amounts of taxable property per capita were considered. Taxes per capita increased as taxable property per capita increased when towns with the same density of population were considered. Town-tax rates per $1,000 of full value of taxable property were influenced by the density of population and by the taxable wealth per capita. The highest tax rates were in the towns with a sparse population and

little taxable property per capita. The lowest tax rates were in the towns with a relatively dense population and large amounts of taxable property per capita."

Cost of production of sweet corn: Data from studies in 6 States, selected years, 1919–33, compiled by H. W. HAWTHORNE (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 13*).—This is a compilation of data obtained in cost studies by the Department and State agencies in Maine, Maryland, New Jersey, New York, Pennsylvania, and Washington from 1919 to 1933, inclusive.

The cranberry industry in Massachusetts, C. D. STEVENS, H. J. FRANKLIN, C. I. GUNNESS, and V. C. PETERSON (*Massachusetts Sta. Bul. 332 (1936), pp. 36, figs. 10*).—This survey was made in cooperation with the New England Crop Reporting Service as part of the programs of the Federal Emergency Relief Administration and the Civil Works Administration. The analysis is based on data obtained by visits to owners and covers the year 1934. It covers potential cranberry bog acreages, size of bog holdings, types of flowage, pumping plants, varieties of cranberries grown, production in Massachusetts and other sections of the United States, marketing, cranberry prices, labor in the cranberry industry, etc. Data are also included in regard to the insecticides used in 1933 and frost injury. Results of this survey and a general survey of the industry made in 1924 are compared and the more important changes in the industry noted.

Preliminary report of an economic survey of 224 coffee plantations in Puerto Rico during 1934 [trans. title], J. M. GARCIA (*Puerto Rico Col. Sta. Circ. 104 (1936), Span. ed., pp. 27*).—The data included 41,241 cuerdas (40,053 acres), of which 21,373 cuerdas were cultivated, 11,577 being in bearing coffee trees. Tables are included showing the utilization of land, distribution of capital, areas in production of and returns from crops, age of coffee trees, crop index, receipts, expenditures, etc. An analysis is made of the effects of area in coffee, capital invested, receipts, expenses, crop indexes, uses of fertilizers, system of management, location of plantation, and other factors upon farm and labor income and of the effects of combinations of two and three of these factors on farm income.

Grazing districts in Montana: Their purpose and organization procedure, M. H. SAUNDERSON and N. W. MONTE (*Montana Sta. Bul. 326 (1936), pp. 39, figs. 13*).—The legislation, administrative agencies, and rules and the procedure for organizations and operations applicable to grazing districts in Montana are discussed. Appendixes include summaries of the major laws, rules and regulations promulgated by the Montana Grazing Commission, and the cooperative arrangement of the U. S. Department of the Interior and Montana grazing districts.

Price factors in the San Diego milk market, J. M. TINLEY (*California Sta. Mimeogr. Rpt. 54* [*1936*], *pp. 25, figs. 4*).—Data are presented and analyzed, mainly by months, January 1929 to August 1936.

The author found that the base price to producers in San Diego should be 6 to 8 ct. higher than that in Los Angeles where the base price in September 1936 has been set at 69 ct. per pound of milk fat. These San Diego prices "would be 70 percent and 72 percent, respectively, of the 1929 level of prices. Farm wages are approximately 72 percent of the 1929 level so that a price of 77 ct. per pound of milk fat would have about the same purchasing power in terms of wages as in 1929. Wholesale prices in Los Angeles of a composite feed ration in August 1936 averaged about $18.78 a ton or 0.94 ct. a pound. The buying power of market milk at 75 to 77 ct. a pound milk fat would thus vary from 80 lb. to 82 lb. This is somewhat higher than the 1929 level

of 78.7 lb. It must be remembered, however, that in 1929 a much larger percent of all milk produced in San Diego County was sold at the base price than is true at the present time. The decline in the average prices received by producers (for all milk produced) is undoubtedly greater than the decline in base prices."

A study of cooperative milk marketing associations in four Ohio markets, R. W. SHERMAN (*Ohio Sta. Bul. 574 (1936), pp. 61, figs. 3*).—This study of cooperative milk marketing associations in the Akron, Dayton, Portsmouth, and Columbus markets was made in cooperation with the U. S. Farm Credit Administration to determine the progress and effectiveness and the satisfaction to producers of such associations. Data on the operations and policies of the associations were obtained from the officers of the associations. From 76 to 216 producers in each market were interviewed concerning their views and attitudes toward the association and its activities. Special studies were made for each area of the plans of marketing, sampling and testing, transportation, and membership relations. Data on quality improvement, cooperative purchasing of supplies, and legislative activities were also analyzed. Milk marketing cooperation in Ohio and the fluid milk industry in each of the markets studied are described.

All four markets were using the base and surplus plan in adjusting supply to demand. Of the producers interviewed, 51 percent thought the plan used in their market was proving of value to them and 37 percent were unfavorable to the plan. Thirty-four percent of the members were more favorable to their association than when they joined, while 19 percent were less favorable. Legislative control of milk marketing by the State was desired by 64 percent of the members of the associations interviewed. Thirty percent felt that the need for an association was distinctly lessened by State control, while 47 percent felt that the need was as great under State control as without such control. Two hundred and thirty-two suggestions for added activities for the association and 43 suggestions for curtailments or eliminations were made by members. Testing, milk distribution, and handling of surplus milk were the activities most freqnently suggested for addition. Better prices, a stabilized market, better hauling conditions, and more accurate testing were the more important benefits of the association mentioned by members.

Agricultural organization in New Zealand, H. BELSHAW, D. O. WILLIAMS, F. B. STEPHENS, E. J. FAWCETT, H. R. RODWELL, ET AL. (*Melbourne: Melbourne Univ. Press; New York: Oxford Univ. Press, 1936, pp. XX+818, [figs. 32]*).—This book, prepared under the direction of H. Belshaw, is one of a number of surveys into land utilization in various Pacific countries authorized by the research committee of the Institute of Pacific Relations. It is a survey of land utilization, farm organization, finauce, and marketing. "The technic of land utilization is conditioned by a wide variety of factors such as land tenure, transport, markets, price movements, organizations, associations and institutions, as well as by conditions of soil, climate, topography, and the stage of development of the agricultural arts. Because of their bearing on land utilization, the above and other problems, which may be grouped broadly under the general heading of organization, have been dealt with as adequately as possible."

Meat consumption in rural Tennessee, with regional comparisons, C. E. ALLRED and J. C. POWELL (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Rpt. 18 (1936), pp. I+26, figs. 13*).—For the purposes of this study, the State was divided into nine distinctive districts and their meat consumption compared.

Consumption of dairy products and eggs in rural Tennessee, with regional comparisons, C. E. Allred and J. C. Powell (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Rpt. 19 (1936), pp. 1+22, figs. 15*).—This study indicates the per capita consumption of dairy products and eggs among white farm owners in the different regions of Tennessee, and in comparison in other States.

Consumption of vegetative foods in rural Tennessee, with regional comparisons, C. E. Allred and J. C. Powell (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Rpt. 20 (1936), pp. [1]+33, figs. 25*).—This deals with the consumption of corn and corn products, wheat and wheat products, potatoes, sweetpotatoes, rye, buckwheat, barley flour, pearl barley, rice, dried beans and peas, peanuts, bananas, and oatmeal.

Size of daily price range of dominant Chicago wheat future in relation to its price, P. Mehl (*U. S. Dept. Agr., Grain Futures Admin., 1935, pp. 11, figs. 2*).—This study covers the period July 1, 1923, to June 30, 1932. It shows that "(1) more than 80 percent of the daily ranges in prices of wheat futures at Chicago are less than 3 ct.; (2) there is a tendency for the range to widen as the price of the future advances; (3) 70 percent of the time the range in price of the dominant or most active wheat future is equal to 1 to 3 percent of the high price of the future for the day; [and] (4) ranges which may be considered as abnormal when prices of futures are between 50 ct. and $1 may, on the other hand, be said to be normal when prices are between $1 and $2."

Seasonal tendencies in wheat futures prices, H. S. Irwin (*U. S. Dept. Agr., Grain Futures Admin., 1936, pp. [3]+27, figs. 3*).—A study was made of the weekly average prices of the Chicago May future beginning with the 1885 May future but excluding the period 1914–15 to 1921–22, inclusive, because of the effects of the World War and disturbed conditions immediately following the war and the futures following the May 1930 future because of the effects of stabilization activities in 1930–31 and for some time later.

It "reveals an irregular but well defined tendency toward two cycles per 12 mo. Each cycle consists of an advance which is followed more or less promptly by a decline. These cycles are occasioned only indirectly, if at all, by fundamental conditions such as the balance between demand and supply, the rate of marketing, and kindred factors. They are governed in the main by what may be termed broadly the 'technical conditions' of the market, including the degree of public participation and the way in which the numerous small traders enter and leave the market. Ordinarily the first cycle, which may be termed the summer cycle, begins in April and extends through the first part of September, but if there is a substantial upturn in price in late July or in August, the cycle may be prolonged into November or December. The second cycle, which may be designated as the winter cycle, usually begins its upward movement in the late fall or early winter, although the time is influenced by the termination of the summer cycle. Most frequently it is ended sometime in March."

The author believes that "further study of the little-known technical conditions of the futures market may open the way to definite improvements in wheat marketing. The practices which make up the sum total of these conditions have never been examined with respect to their influence upon the market, and the facts revealed thus far suggest that some of them are susceptible of correction."

Crops and Markets, [**September–October 1936**] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), Nos. 9, pp. 297–336, figs. 3; 10, pp. 337–376, figs. 3*).—Included are tables, charts, reports, summaries, etc., of the usual type.

International yearbook of agricultural statistics, 1933–34 (*Internatl. Inst. Agr. [Roma], Internatl. Yearbook Agr. Statis., 1933–34, pp. XXXVI+818*).—This is a continuation of the series previously noted (E. S. R., 71, p. 551). A number of new tables have been added, especially in the sections devoted to the apportionment of areas, agricultural production and numbers of livestock in different countries, international trade, prices, and distribution of agricultural holdings according to size and mode of tenure.

RURAL SOCIOLOGY

Mobility of population in Assumption and Jefferson Davis Parishes, Louisiana, T. L. Smith, M. Byrd, and K. Shafer (*Southwest. Social Sci. Quart., 17 (1936), No. 1, pp. 31–37*).—The data show that the population of the rice area is characterized by higher mobility, both territorial and occupational, than the population of the cane area. The evidence seems to show that negroes shift about within a limited area more than whites, but that long moves involving interstate and international migrations are more prevalent among the white population. The data also seem to show no pronounced differences between the races in occupational shifting, although the mobility among whites may be slightly above that among the negroes. "Of all the occupational groups, territorial mobility is greatest among the laborers and the business and professional men. It is least among farm owners and farm tenants. The rankings in occupational mobility are similar to the rankings in territorial mobility. It is very significant that the relief population has shifted both residence and occupation more frequently than the nonrelief population."

Population trends in Minnesota, R. W. Murchie and M. E. Jarchow (*Minnesota Sta. Bul. 327 (1936), pp. 99, figs. 54*).—The movement of settlers into the Minnesota region was well under way in the early 1820's. In 1860 the population of the State was 172,023. By 1930 it had grown to 2,563,953.

In 1860, 45.9 percent of the State's population were natives of other States, 34.14 percent were foreign-born, and 19.94 percent were natives of Minnesota. In 1930, 20.02 percent were natives of other States, 15.24 percent were foreign-born, and 64.74 percent had been born within the State. In 1910 the number of foreign-born in the State was 543,010, while in 1920 it was but 388,294.

In 1860 the German states had supplied 18,400 settlers to Minnesota, Ireland 12,831, Norway 8,425, Canada and British America 8,023, England 3,462, and Sweden 3,178. In 1930 Sweden had supplied 90,623 settlers, Norway 71,562, Germany 59,903, Finland 24,360, other Canadians 20,618, and Poland 15,015.

In 1920 the urban population constituted 44.1 percent of the State's population, while in 1930 it was 49 percent. In 1920 the rural farm population constituted 37.4 percent of the population, as against 34.6 percent in 1930. The rural nonfarm, or village, in the former year was 18.5 percent of the population and 16.4 percent in 1930. In general, the heaviest losses in rural population during the decade 1920–30 were in the extreme northern part of the State.

In 1880, 49.8 percent of the population were 19 yr. of age and under, while in 1930 but 38.28 percent were in that age group. For the age group 45 yr. of age and over the figure for 1880 was 14.6 percent and in 1930, 24.1 percent. The urban element of the population in 1930 had a disproportionately large share of the age group 20–55 yr. in the population. For the rural farm element a disproportionately large number were found in 1930 in the age groups under 20 yr. The village in 1930 contained a disproportionately large number of the population 65 yr. of age and over.

In 1850, 61.15 percent of the population were males; in 1930, 51.35 percent were males. Among the foreign-born a rather large excess of males over females still existed in 1930, 217,983 to 170,311.

In St. Paul and Minneapolis the ratio of males to females in 1890 was 109.4 males to 100 females and 113.7 to 100, respectively. By 1930 these ratios were 93.9 to 100 and 94.4 to 100, respectively. Thus, more and more women have gone to the two largest cities in recent years. The number of females in 1930 exceeded the number of males in the most productive age groups for the urban and village areas, while the reverse was true for the farm regions. In the higher age groups the number of males tends to exceed the number of females in all three areas, urban, farm, and village.

There has been a steady decrease in the size of families until in 1930 there was an average of 3.9 persons to a family. The rural farm had the largest percentage of single males. The largest proportion of divorced were the urban females. In the villages there were nearly twice as many widowed females as males.

Minnesota has shown a constantly falling birth rate from 24.7 in 1915 to 17.9 in 1932. The death rate has varied little since 1910, remaining close to 10 per thousand. This is significant, however, because the population is becoming increasingly larger in the older age groups. From 1920 to 1930 births exceeded deaths by 287,217, yet the State's population increased by but 176,828, showing that a net migration of 110,389 from the State occurred.

Only 1.2 percent of the population 10 yr. of age and over were classed as illiterate in 1930; 98.6 percent of the urban population 7–13 yr. of age attended school, while 97.6 percent of the rural element in that age group attended. The comparable figures for the age group 7–20 yr. were urban 79.1 percent and rural 74.7 percent. Of the foreign-born 7–20 yr. of age, 58.2 percent attended school. Minnesota's white population constituted 99 percent of the total population.

Some characteristics of rural families on relief in New York State, W. A. Anderson (*Rural Sociol., 1 (1936), No. 3, pp. 322–331*).—The data presented are a summarization of three separate studies of relief families conducted in rural New York State by the department of rural social organization of Cornell University in cooperation with the Federal Emergency Relief Administration. Rural was defined in these studies as including all incorporated and unincorporated villages of less than 5,000 inhabitants and the open country. On this basis from 4 to 6 out of each 10 rural relief cases are open-country residents and from 4 to 7 out of each 10 are village residents.

Rural relief families contain, on the average, about one more person than is found in the families of the general rural population, and 6 or more members in twice as many instances. "Not only are relief families large, but they contain a significant proportion of dependent children less than 16 yr. of age. In the Tompkins-Wayne and the four-county studies, 48 percent of all persons in the relief families were children less than 16 yr. of age. . . .

"In each of the three studies, a larger proportion of the village than of the open-country families on relief were without a male head. The open-country family that has lost the help of the father seems to be able to care for itself more successfully than the village family in the same circumstances, and there is a larger relative concentration of broken families in the villages than in the open country. . . .

"Fully three-fourths of the male heads of rural relief families followed industrial activities or had no usual occupation. Of these, about one in a hundred were professional or proprietary workers. From 10 to 15 percent of

them followed skilled trades, while 40 to 60 percent were unskilled laborers. From 15 to 20 percent of these family heads followed no usual occupation. . . .

"Heads of families in the rural relief population are native-born in from 85 to 90 percent of the cases. . . .

"In October 1933, Tompkins and Wayne Counties gave direct relief only to 86 percent of the families. Then works projects under varying sponsors began to appear, and in the 17-county study only 40 percent received direct relief as of October 1934, while 48 percent received work relief only. . . .

"Of the families studied in Tompkins and Wayne Counties as of October 1933, 12 percent, and of those studied in the 17 counties as of October 1934, 14 percent had received relief 4 yr. or more.

"Heads of rural relief families are not farm owners or operators, except in about one in 10 cases. Nor have these family heads ever had farming experience. Foreign families in rural areas contribute no larger proportions of persons to the relief rolls than they constitute of the total population. Schooling is decidedly lacking among the relief population, the average number of school grades completed by the family head being six. Direct relief in the form of food orders, clothing, and money constituted the chief aid given these families. The relief history of the families showed increasing proportions are remaining on the relief rolls, year by year, since 1930."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Bibliography of research studies in education, 1934–1935 *(U. S. Dept. Int., Off. Ed. Bul. 5 (1936), pp. XV+287)*.—*This bibliography covers the school year September 1934 through August 1935. It lists 2,971 studies reported by 145 institutions and consists of 384 doctors' dissertations, 2,368 masters' theses, and 219 studies reported as faculty research. It includes "current educational conditions in the United States and in foreign countries, history of education, educational research, the building of the curriculum, the subjects of the curriculum, education from preschool days through higher education, the training and status of teachers, school administration and management, the education of racial and exceptional groups, and various types of libraries and their use." Included are 22 references on agricultural education and 54 on home economics.*

State provisions for equalizing the cost of public education, T. Covert *(U. S. Dept. Int., Off. Ed. Bul. 4 (1936), pp. V+49)*.—The need for State school support and the degrees of responsibility assumed by the State governments for the financial support of public schools are described, and a number of plans used by different States in financing the public schools are discussed in chapters on public education chiefly at State expense, significance of apportionment methods in equalizing school costs, recent increases in State funds for education and methods of apportioning the increase, States which provide for school support chiefly by local taxation, and State aid for special education projects.

Agricultural education in the world.—I, II, Europe, A. Brizi *(L'Enseignement agricole dans le monde. Vols. I, II, Europe. Roma: Inst. Internatl. Agr., 1935, vol. 1, pt. 1, pp. [XV]+335; 1936, vol. 2, pt. 2, pp. [7]+466)*.—These volumes assemble information regarding agricultural instruction in Europe collected by the International Institute of Agriculture. For each country there is a short description of the general organization of agricultural instruction followed by more detailed information on institutions for such instruction classified under the headings of higher agricultural instruction, secondary agricul-

tural instruction, elementary agricultural instruction, and instruction in domestic economy. Matters related to animal husbandry, rural engineering, dairying, aviculture, and forestry are omitted or only briefly mentioned.

Volume 1 includes Germany, Albania, Austria, Belgium, Bulgaria, Denmark, Danzig, Spain, Estonia, the Irish Free State, Finland, France, Great Britain (England and Wales, Scotland, North Ireland), and Greece. Volume 2 includes Hungary, Iceland, Italy, Latvia, Lithuania, the Grand Duchy of Luxemburg, Norway, the Netherlands, Poland, Portugal, Rumania, Sweden, Switzerland, Czechoslovakia, the Turkish Republic, the Union of Soviet Socialist Republics, and Yugoslavia.

The text is in both English and French.

References on agricultural museums, E. E. Edwards (*U. S. Dept. Agr., Library, Bibliog. Contrib. 29 (1936), pp. V+43*).—Included are 36 general references on museums, including bibliographies, directories, manuals, and references on the utility of museums, and 131 references on agricultural museums, 10 being comprehensive references and the remainder references by countries.

FOODS—HUMAN NUTRITION

The relative value of various lards and other fats for deep-fat frying of potato chips, F. B. King, R. Loughlin, R. W. Riemenschneider, and N. R. Ellis (*Jour. Agr. Res. [U. S.], 53 (1936), No. 5, pp. 369–381, figs. 4*).—Tests were made on 9 fats, including 3 kettle-rendered lards obtained from animals fed peanut, corn, and brewer's rice rations, and 6 commercial fats, including standard prime steam and hydrogenated lards, a hydrogenated cottonseed oil, and highly refined corn, cottonseed, and peanut oils. To find the extent of deterioration, the peroxide number, iodine number, and free fatty acid content were determined before and during the frying period. The free fatty acid content of the fats extracted from the chips in the first and tenth fryings was also determined. Two series of 2-min. frying tests were made, with the initial temperature of the fat at 185° C. and each fat being used for 10 fryings. The chips were drained, weighed, and stored in tightly covered jars until the following day, when samples were scored for color, luster, aroma, crispness, oiliness, and flavor.

The results show that fat absorption was practically uniform for all fats. Analysis of the fats after use demonstrated slight increases in fatty acid content, increases in peroxide values, particularly in the lards, and decreases in the iodine number. The percentage of free fatty acid in the fat extracted from the chips was greater than in the frying fat. The least deterioration, as indicated by color, was noted in the oils and the greatest discoloration in the lards with the exception of hydrogenated lard. The most desirable color and highest luster in the chips were produced by the cottonseed, peanut, and corn oils and the peanut lard and the least desirable by the hydrogenated corn and rice lards. The four oils gave the most desirable aroma, with hydrogenated lard intermediate in value, and the other lards judged as neutral to undesirable. The desirability of flavor was the most important item in determining the general grade of the various fats, peanut oil being judged to impart the least pronounced and therefore the most desirable flavor, followed in order by corn oil, cottonseed oils, peanut lard, hydrogenated lard, and corn, rice, and prime steam lards. When judged by general desirability, cottonseed oil preceded corn oil. All chips had approximately the same degree of crispness, with little difference in oiliness. The general quality of the chips was altered by deterioration of the fats as the number of fryings increased. After 10 fryings the chips fried in the oils were still superior.

Weekly organoleptic tests revealed that storage in the absence of light at 3.2° and 22.6° for 60 days retarded the development of rancidity in most cases without affecting the crispness of the chips.

The potential alkalinity of honey: Its acid-base value as a food, R. E. Lothrop (*Jour. Nutr., 11 (1936), No. 6, pp. 511–514*).—Using the direct titration method of Davidson and LeClerc (E. S. R., 74, p. 156), the author found the average alkaline value of 11 samples of honey, representative of both light and dark varieties, to be 1.5 per 100 g of honey. This value compares favorably with certain fruits and vegetables.

Home canning of fruits, vegetables, and meats, L. Stanley and M. C. Stienbarger (*U. S. Dept. Agr., Farmers' Bul. 1762 (1936), pp. 11+38*).—This is a revision of and supersedes Farmers' Bulletin 1471 (E. S. R., 56, p. 189). Directions for canning meats and chicken have been added.

Egg-white as sole source of protein and vitamin B_2 for young rats, F. J. Gorter (*Biochem. Jour., 29 (1935), No. 2, pp. 322–329, figs. 3*).—In this contribution to the problem of egg white injury, the following conclusions were reached:

"The toxic effects of egg white (when present as sole source of protein and vitamin B_2 in the diet), which cause the well-known skin disorder in young rats, can be counteracted by substitution of purified caseinogen for part of the egg white. The dietary factor contained in caseinogen and lacking in egg white is present also in liver, yeast, and egg yolk. It is insoluble in dilute or strong acid alcohol or in ether. While differing in solubility from the known B-vitamins and from the dietary factor in commercial caseinogen described by Coward et al., it would appear to be similar in distribution and function to the 'factor X' described by Boas, and partly also to the 'factor Y' described by Chick et al. The possibility that it may be an amino acid is not excluded."

Phytin in human nutrition, R. A. McCance and E. M. Widdowson (*Biochem. Jour., 29 (1935), No. 12, pp. 2694–2699*).—This paper describes a method for estimating small amounts of phytin by extracting the phytin from 5 to 10 g of dried, finely ground material with hydrochloric acid and precipitating it as the ferric salt. The phytin phosphorus was estimated after sulfuric-perchloric acid incineration. The phytin content of the edible portions of 64 foodstuffs was determined and is reported in milligrams of phytin phosphorus per 100 g and in phytin phosphorus as percentage of total phosphorus.

The fate of ingested phytin was investigated in four subjects, 2 men and 1 woman and a 4½-year old boy, and it was shown that from 20 to 60 percent was excreted unchanged in the feces.

A study made of freely chosen diets of 63 men and 63 women of the English middle class showed that the phytin phosphorus intake constituted less than 5 percent of the total phosphorus.

Basal metabolism of older women, H. McKay and M. B. Patton (*Ohio Sta. Bul. 575 (1936), pp. 16, figs. 2*).—This complete report of an investigation previously noted in progress reports (E. S. R., 71 p. 423) gives the basal metabolism figures for a group of 73 women ranging in age from 35 to 70 yr. The Benedict-Roth closed circuit respiration apparatus was used, following the procedure described in a previous report (E. S. R., 64, p. 492). The subjects were divided into four age groups, 35–39, 40–49, 50–59, and 60–69 yr.

The average total heat production for the 35–39 yr. age group was found to be 1,377 calories, 21.7 per kilogram and 8.46 per centimeter per 24 hr., and 33.99 per square meter per hour as compared with 1,382 total calories, 21.13 per kilogram and 8.46 per centimeter per 24 hr.; and 33.64 per square meter per hour for the 40–49 yr. age group. For the 50–59 yr. age group, the average total heat production was 1,297 calories, 19.47 per kilogram and 8.03 per centimeter per 24 hr., and 31.57 per square meter per hour as compared with 1,128 total

calories, 20.4 per kilogram and 7.17 per centimeter per 24 hr., and 30.29 per square meter per hour for the 60–69 yr. age group. The general conclusions drawn are as follows:

"These findings justify the conclusion that basal metabolism of women remains at a fairly uniform level until the age of 50 or thereabouts is reached, after which the heat production declines to a definitely lower level."

A study of the winter dietary in Nanking, L. T. CHENG, H. TAO, and C. K. CHU (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser., 10 (1935), No. 6, pp. 297–302*).—The data on the dietary used in this study were collected during November and December 1934. The families, selected from various professions in Nanking and its vicinity, were divided into four groups, noted as A, B, C, and D, according to their respective incomes per month.

The average distribution of foods of the dietary consisted of 41.01 percent rice, 27.07 leafy vegetables, 9.84 meats, and 6.01 percent legumes. The average calorie intake of group A was in excess of daily requirement; of groups B and C was adequate; and of group D was more than 320 calories below the average required for maintenance. The protein intake was adequate for all groups, and the source was animal to the extent of 28 percent in the A group, 25 percent in the B group, and 17 percent in the C group, but was entirely vegetable in the D group. Vitamins A and D were adequately supplied by fish, eggs, milk, and green vegetables for the two upper wage groups, but probably were deficient for groups C and D as indicated by frequent cases of xerophthalmia in these families. Vitamin B was deficient in the dietary because of the use of highly refined cereals, and this was borne out by frequent cases of beriberi and loss of appetite. Vitamin C was probably deficient in the winter dietary of all the groups, due to the custom of cooking all foods thoroughly and to the insignificant quantities of fresh fruits used, especially by group D. The high percentage of tooth and gum disease among the families of this group is considered significant in indicating vitamin C deficiency. According to the Sherman standards, Ca, P, and Fe were adequate in the dietary for body maintenance.

The basal metabolism of male Chinese in Manchuria, F. G. BENEDICT and H. S. D. GARVEN (*Chin. Jour. Physiol., 10 (1936), No. 1, pp. 141–147, fig. 1*).—The Benedict field apparatus (E. S. R., 60, p. 893) was used to measure the basal metabolism of 20 male Chinese subjects from 16 to 36 yr. of age. The data were reported as a preliminary survey, since the periods of observation were short.

"The subjects of average weight, 54.1 kg and 168 cm standing height, gave an average pulse rate of 58 per minute, respiration rate 15, [and] oxygen consumption 208 cc per minute, with an average metabolism of 3.5 percent below the Harris-Benedict standard."

Nitrogenous metabolism in Manchuria, C. F. WANG (*Chin. Jour. Physiol., 10 (1936), No. 1, pp. 135–140*).—The urines of 20 medical students and 8 workmen (4 college servants, 1 vegetable seller, and 3 masons) were analyzed for total nitrogen by the macro-Kjeldahl method, for urea nitrogen by Van Slyke's manometric method, for ammonia nitrogen by Folin's permutite method, for uric acid nitrogen by Benedict's direct colorimetric method, and creatinine by Folin's colorimetric method. The diets of the college students consisted of meat and fish, eggs, oils and fats, rice, wheat flour, beans and bean products, vegetables, and tubers. The coolies lived on third class hospital food and the vegetable dealer and masons lived chiefly on millet and vegetables.

Analyses of the 24-hr. samples of urine gave the following average values for the students and workmen, respectively: Total nitrogen 11.263 and 11.105 g, urea nitrogen 8.34 and 8.401, uric acid nitrogen 0.107 and 0.1928, ammonia nitrogen 0.671 and 0.688, and creatinine 0.571 and 0.603 g. These data are compared

with data reported in the literature for Chinese subjects in China, Manchuria, and India and with European standards.

Iodine in cabbage, J. F. McClendon and C. E. Holdridge (*Biochem. Jour., 29 (1935), No. 2, pp. 272–274, fig. 1*).—Data are reported on the iodine content of cabbage from different parts of Minnesota, following the same plan as in an earlier study of the iodine content of potatoes in the same State (E. S. R., 73, p. 713). The data in the two studies show a strong inverse relationship between the iodine content of both vegetables in certain sections of the State and the number of cases of goiter reported among drafted men from these regions in the World War.

Copper metabolism in man, T. P. Chou and W. H. Adolph (*Biochem. Jour., 29 (1935), No. 2, pp. 476–479*).—In copper balance experiments conducted on three Chinese subjects—one female aged 36 and 37 yr. in two series of experiments, one male aged 17, and one female aged 62 yr.—subsisting on simple diets of measured copper content, equilibrium was reached at an intake of approximately 2 mg of copper per day. It is pointed out that this amount in relation to the accepted iron requirement of 15 mg per day is approximately similar to the 1:7 ratio of copper and iron requirements for the rat, as determined by Hart et al. (E. S. R., 59, p. 892).

In spite of changes in the copper intake, the excretion in the urine remained fairly constant, averaging 0.25 mg per day. The excretion in the feces was much more irregular, indicating that in man copper is excreted chiefly in the feces. From analyses of tissues of cadavers, it was estimated that the adult body contains between 100 and 150 mg of copper.

Variations of copper in the blood of normal infants of different ages [trans. title], E. Lesné, P. Zizine, and S. B. Briskas (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 15, pp. 1582, 1583*).—Using a modification of the MacFarlane method, the authors have determined the copper content of the blood of infants, beginning with fetuses of from 5 to 6 mo. Among the living infants the range was from 0.073 to 1.06 mg copper per liter of blood at the age of from 1 to 10 days, with increasing values to about 1.35 mg between the second and third months, after which the values rose only slightly, with little variation except in pathological cases.

The copper and "inorganic" iron contents of human tissues, S. L. Tompsett (*Biochem. Jour., 29 (1935), No. 2, pp. 480–486*).—Methods for determining copper and inorganic iron in various tissues and bones of the human body are described, and data are reported on the content of these constituents in various human tissues. Data are also reported on the copper content of cow's milk.

The method used for determining copper in everything except bones and milk was the same as previously described for blood (E. S. R., 73, p. 718). Because of the interference of the large amounts of calcium phosphate in the bones and milk, a new method was developed for extracting copper from these materials. This consists essentially in the extraction of the copper from solutions of bone and milk ash by sodium diethyldithiocarbamate and ether in alkaline solution in the presence of pyrophosphate to prevent extraction of the iron. On repeated shaking the copper complex is taken up by the ether, which is then separated from the aqueous layer and evaporated on a steam bath, the organic matter destroyed by heating with concentrated sulfuric acid and perchloric acid, and the copper finally determined in an aliquot of a dilution of the residue. In determining inorganic iron, sodium pyrophosphate was used to break down the complexes before extracting the iron with trichloroacetic acid.

The iron and copper contents and the haemopoietic activities of stomach and liver preparations, H. Jackson, L. Klein, and J. F. Wilkinson (*Biochem. Jour., 29 (1935), No. 2, pp. 330–337*).—To determine whether or not the quantities of iron and copper present in various liver and stomach preparations and

fractions used in the treatment of pernicious anemia could be correlated with the effectiveness of these materials as judged by clinical treatment, a number of such fractions of known clinical potency were analyzed for iron and copper by colorimetric methods, the technic of which is described in detail.

No relationship could be found between the iron and copper content and the clinical potency of the preparations tested. Moreover, the total amounts of iron and copper present were infinitesimal in comparison with the quantities ingested in an ordinary diet and with the normal therapeutic dosage for other anemias.

The therapeutic action of iron, L. J. WITTS (*Lancet [London], 1936, I, No. 1, pp. 1–5, figs. 2*).—This is a general discussion, with numerous references to the literature, of factors which affect the requirement, absorption, and utilization of iron. Concerning iron therapy, the statement is made that "to a large extent iron is used to repair deficiencies which would not have occurred had the diet been satisfactory, and as the hygiene and nutrition of the world improve, we may expect conditions such as the 'physiological' anemia of pregnancy, the nutritional anemia of infancy, and the anemia of hookworm infestation to follow chlorosis into the limbo of vanished diseases. But the value of diet in anemia is essentially prophylactic, and when the iron supplies of the organism are exhausted it is hard to replenish them in a reasonable time from the food. We can foretell no decrease in those forms of anemia which cannot be prevented by diet alone, such as idiopathic hypochromic anemia and pernicious anemia, in which the absorption of iron is impaired, and splenic anemia and chronic hemorrhagic anemia, in which excessive amounts of iron are lost."

Studies on the interrelationship of vitamins and other dietary constituents.—I, Vitamins A and D and other dietary constituents in relation to the formation of urinary calculi, H. C. HOU (*Chin. Jour. Physiol., 9 (1935), No. 3, pp. 299–305*).—In this investigation eight different combinations of diet were given to eight comparable groups of rats, and the presence of urinary stones determined by radiographic, gross, and microscopic observation. The results showed that urinary calculi developed in rats on vitamin A-deficient diets when the vitamin D dosage was high, when the protein content was high, or when the phosphate content was low. On the other hand, low protein and high starch decreased the number of calculi cases. No calculi developed in rats receiving a high cereal diet supplemented with cod-liver oil.

The influence of cooking and canning on the vitamin B and G content of lean beef and pork, F. W. CHRISTENSEN, E. LATZKE, and T. H. HOPPER (*Jour. Agr. Res. [U. S.], 53 (1936), No. 6, pp. 415–432, figs. 6*).—In this contribution from the North Dakota Experiment Station, two series of feeding tests were made with young albino rats. The vitamin B-free basal diet consisted of purified casein 20 percent, Crisco 8, cornstarch 51, cod-liver oil 2, McCollum salt mixture (No. 185) 4, and autoclaved baker's yeast 15 percent. In the vitamin G-free diet the autoclaved yeast was replaced by 10 percent of a commercial vitamin B preparation and 5 percent of added cornstarch. During the 8-week experimental period, dried raw, cooked, and autoclaved beef and pork were fed to separate groups (1) as varying percentages of the basal diet and (2) as definite amounts separate from the basal diet. Chemical analyses indicated that 1 part of dried product was equal to 3.3–4 parts by weight of the fresh meat.

The units of vitamin B were computed according to the method of Chase and Sherman. The dried lean raw beef contained an average of approximately 2.5 units per gram, equivalent to 0.6 unit per gram of fresh beef. The amount in the dried lean raw pork was approximately 24 units per gram, equivalent to 7 units per gram of fresh pork. A loss of approximately 20 percent in the beef and 12 percent in the pork resulted from cooking at a temperature not exceeding 90° C., giving values of 2 units per gram of cooked dried beef and 21

units per gram of cooked dried pork. The vitamin B content of the beef was almost completely destroyed by heating in an autoclave or pressure cooker for 70 min. at 10 lb. pressure. The autoclaved pork lost approximately 21 percent of the vitamin B potency, giving a value of 19 units per gram of dried material.

The units of vitamin G at the different levels of feeding were computed according to the method of Bourquin and Sherman. The average units per gram of dried pork were as follows: Raw 6.9, cooked 6.5, and autoclaved 7.3. The values for dried beef were when raw 4.9, cooked 4.4, and autoclaved 5.1 units. The data indicate no destruction of vitamin G as a result of either cooking or autoclaving by the methods employed in this study.

Studies of crystalline vitamin B_1 IV–VI (*Jour. Nutr., 10 (1935), Nos. 1, pp. 25–33, fig. 1; 35–44, figs. 7; 2, pp. 161–166, figs. 3*).—In continuation of the series noted previously (E. S. R., 75, p. 587), three papers are presented.

IV. *Injection method of assay*, M. Ammerman and R. E. Waterman.—This paper describes a modification of the Smith injection technic (E. S. R., 63, p. 291) for the determination of vitamin B (B_1), with data showing the consistency of the results with various lots of crystalline vitamin B_1 hydrochloride. The curative dose was established at 5γ. On this dosage the average length of cure in five tests was 6.2 days.

The method is considered preferable to others for the assay of therapeutic preparations and to be practical for the assay of all foods from which the vitamin can be extracted in solution.

V. *The effect of graduated doses on growing rats*, R. E. Waterman and M. Ammerman.—The various units for vitamin B (B_1) have been compared by means of feeding tests, using the crystalline vitamin B_1 hydrochloride, with the conclusion that 5γ of the crystalline hydrochloride is equivalent to the Smith unit and to 2 Sherman-Chase units and that 7.5γ is equivalent to 1 Chick and Roscoe unit.

When increasing doses of crystalline vitamin B_1 hydrochloride ranging from 0.5γ to 160γ per day were fed to rats, growth was enhanced by each successive addition. Inasmuch as the highest dosage administered was from 80 to 160 times that necessary for maintenance of life, several questions are raised with regard to the physiological action of this vitamin. "It is obvious that B is not solely an antineuritic vitamin but plays an important role in the general physiological economy."

VI. *The effect of graduated doses on pigeons*, R. E. Waterman and M. Ammerman.—The curative potency of crystalline vitamin B_1 hydrochloride for adult polyneuritic pigeons has been determined, with results leading to the conclusion that the minimum curative dose is approximately 4γ. Attempts to increase the weight of previously depleted pigeons by increased amounts of vitamin B_1 were unsuccessful even at a dosage of 160γ. This is thought to furnish additional evidence of the existence of another B vitamin (B_3) necessary for the complete nutrition of pigeons.

Studies on crystalline vitamin B_1: Experimental and clinical observations, M. G. Vorhaus, R. R. Williams, and R. E. Waterman (*Jour. Amer. Med. Assoc., 105 (1935), No. 20, pp. 1580–1584*).—Clinical observations of the results of crystalline vitamin B_1 medication in various diseases are reported, with the conclusion that vitamin B_1 deficiency in the human dietary is frequent and that administration of vitamin B_1 is indicated in beriberi, suspected beriberi, polyneuritis (alcoholic, infectious, toxic, and so-called metabolic, associated with anemia and with pregnancy), disturbances of the carbohydrate metabolism, localized neuritis, and unexplained anorexia and gastrointestinal hypotonia.

The vitamin B_2 complex.—Differentiation of the antiblacktongue and the "P.-P." factors from lactoflavin and vitamin B_6 (so-called "rat pellagra" factor), Parts I–VI, T. W. Birch, P. György, and L. J. Harris (*Biochem.

Jour., 29 (1935), No. 12, pp. 2831-2850, figs. 13).—In continuation of previous studies by György (E. S. R., 75, p. 282) on the vitamin B_2 complex, six papers are presented.

I. *Differentiation of the P.-P. factor from vitamin B_6 and lactoflavine.*—A comparison was made of the distribution of vitamin B_6 and lactoflavine in different foodstuffs, particularly in cereals, fish, and liver extract, as determined by methods described in the earlier papers of the series. The results showed that 1 rat day dose of vitamin B_6 was contained in from 0.5 to 0.75 g of corn, 0.1 of rice polishings, 0.2 of wheat germ, 0.3 of wheat bran, 0.75 of pea meal, 1 of oats, 1.5 of whole wheat, 3 of polished rice, and 0.3 g of hominy grits, and 1 rat day dose of lactoflavine was contained in 1 g of wheat germ, 1 of wheat bran, 2 of pea meal, 3 of oats, 5 of yellow corn, 1 of rice polishings, 5 of whole wheat, and 5 g of polished rice. Cereals, particularly corn, are therefore relatively rich in vitamin B_6 and in contrast low in lactoflavine.

Since corn is known to be low in the P-P or pellagra-preventive factor, it was concluded that this factor is not identical with vitamin B_6, the rat antidermatitis factor. Further evidence of the nonidentity of the two factors was presented.

II. *Maize in relation to the vitamin B_2 complex and human pellagra.*—Ten rats were placed on a P-P factor-deficient diet containing white corn 85 percent, peanut oil 15 percent, and 6 drops of cod-liver oil per rat per week and further supplemented with vitamin B_1 and lactoflavine. Half of the rats were exposed to ultraviolet light for ½ hr. daily. The growth curves were subnormal for both groups. After the feeding had been continued for 102 days 10 percent of the corn was replaced with casein. At this time the rats showed bald patches and loss of fur, together with a scurfy condition of the skin. The addition of the casein increased the growth rate and the fur became normal, indicating that the condition was due to lack of essential amino acids in the diet. No characteristic skin lesions analogous to human pellagra and no diarrhea were observed in these animals.

It was concluded that rats do not need appreciable quantities of the P-P factor or are able to synthesize it. Further evidence obtained from feeding Goldberger's diet for producing blacktongue showed that rats remained free from skin lesions, but growth eventually became subnormal.

III. *Differentiation of the "antiblacktongue" factor from vitamin B_6 and lactoflavin.*—The purpose of this investigation was to test the curative and preventive actions of vitamin B_6 and lactoflavine on the symptoms of blacktongue in dogs. Three dogs were fed the basal ration containing white corn meal 600 parts, dried pea meal 75, Glaxo (extracted casein) 90, cod-liver oil 28, cottonseed oil 45, $CaCO_3$ 45, and NaCl 15 parts and supplemented with 80 international units of vitamin B_1 daily. This diet was rich in vitamin B_6. One dog was given 10 percent by weight of the diet of autoclaved yeast and was kept as a positive control. The other two dogs became emaciated and increasingly weak. After 76 days they showed incipient lesions on their tongues. Lactoflavine, 30γ per kilogram of body weight per day, given intraperitoneally, failed to protect the animals. After 102 days one dog was given 4 g per day of liver extract 343 and the other 35 g per day of fresh herring. Both dogs improved dramatically. The dogs with blacktongue had hemoglobin values of 40 and 35 percent and red blood cells of 3,320,000 and 2,500,000 per cubic centimeter, respectively. The positive control had a hemoglobin value of 88 percent and red blood cells of 5,200,000 per cubic centimeter.

This evidence is thought to indicate that the blacktongue factor present in the autoclaved yeast, in the liver extract, and in the herring is distinct from lactoflavine or vitamin B_6.

A synthetic diet containing cane sugar 67, extracted casein 20, salt mixture 3, peanut oil 10, and cod-liver oil 20 cc per day was also fed to dogs with vitamin B_1 and lactoflavine as supplements. Positive controls received the synthetic diet plus 7 percent of yeast. When vitamin B_4 was added to the basal diet in the form of 50 g per day of cooked white corn, blacktongue was not cured. Further experiments showed that dogs on the synthetic diets did not thrive unless both vitamin B_4 (corn meal) and the antiblacktongue factor in the form of liver extract 343 were added to the diet. This is thought to confirm the conclusion that the antiblacktongue factor is different from lactoflavine or vitamin B_4, and that dogs kept on synthetic diets containing vitamin B_1 and lactoflavine appeared to need both vitamin B_4 (as found in corn) and the P-P or antiblacktongue factor (as found in liver extract).

IV. *Observations with chickens and other species.*—In explanation of the suggestions of earlier workers that the presence of corn is a necessary condition for the production of symptoms of blacktongue in dogs, it is suggested that "the addition of maize to the diet helps in the production of regular symptoms of blacktongue, not so much because of a toxin present in it as because in its absence the dog may sometimes develop earlier vitamin B_4 deficiency instead of blacktongue." Observations are recorded on the need of the components of the B_2 complex by chickens, mice, rabbits, and guinea pigs. Chicks fed on the "chick pellagra" diet of Elvehjem and Koehn developed skin lesions around the beak which were not cured with lactoflavine. When this diet was fed to rats, they remained free from any symptoms of vitamin B_6 deficiency, and it was shown that 1 rat day dose of vitamin B_6 is contained in 1.5 g. of this diet. Chicks on this diet supplemented with yeast showed a condition suggestive of anemia. When the unheated diet was fed, the anemia was found to be entirely prevented.

Preliminary experiments on vitamin B_2 deficiency in mice were recorded. Guinea pigs and rabbits appeared unsuitable for work on vitamin B_2, as the animals failed to eat sufficient quantities of food.

V. *Vitamin B_6 as the rat anti-acrodynia factor.*—The sypmtoms of vitamin B_6 deficiency are discussed with reference to the descriptive nomenclature, and the suggestion is made that the specific dermatitis associated with the deficiency be named rat acrodynia "without prejudice as to its identity or otherwise with human acrodynia."

VI. *The extrinsic factor for pernicious anaemia.*—Evidence from the literature is reviewed briefly in pointing to the nonidentity of the extrinsic factor for pernicious anemia and either lactoflavine or vitamin B_6.

Vitamins in human nutrition: The excretion of vitamin B_1 in human urine and its dependence on the dietary intake, L. J. Harris and P. C. Leong (*Lancet [London], 1936, I, No. 16, pp. 886–894, figs. 7*).—In this paper a method similar to that used to determine vitamin C subnutrition (E. S. R., 74, p. 888) is described for vitamin B_1 "suboptimum-nutrition." The technic consisted of removing vitamin B_1 from an aliquot part (normally 100–200 cc, or 50 cc if the diet is rich in vitamin B_1) of a 24-hr. specimen of urine by two successive adsorptions with 1 g at each treatment of acid clay. The reaction of the urine was adjusted to pH 5 by the addition of a few drops of hydrochloric acid as necessary before the clay treatment. The combined activated clay specimens were tested directly on the rat by the Harris bradycardia method (E. S. R., 73, p. 567) and compared with graded doses of the international standard in the same manner to a comparable group of rats.

A group of nine healthy adults on normal diet excreted from 12 to 35 international units, or an average of 20 units daily. The response in the amount of the vitamin excreted per day to test doses of 340 and 950 units was related to

the past dietary history and hence to the "resting level" of excretion. Consumption of diets low in vitamin B_1 led to a proportional reduction in the daily output, while a vitamin B_1-rich diet increased the output. Similar results were obtained with rats on vitamin B_1-free diets supplemented with from 120 to 0.2 international units of pure vitamin B_1 hydrochloride. When the dosage was 120 units the rat excreted from 10 to 12 units daily, while negligible amounts of 0.1 unit were excreted when the dosage was from 0.6 to 0.2 unit. The observations on both human beings and rats indicated that only from 5 to 8 percent of the amount ingested was excreted when a steady level of excretion had been reached. The assumption is made that if a subject excretes less than 12 international units the diet contains less than a normal allowance of vitamin B_1. The minimal standard of allowance as determined from surveys of normal diets and of past clinical records was fixed provisionally at 200 units.

Preliminary surveys were made of the state of vitamin B_1 nutrition in groups of healthy and diseased children and adults. The vitamin B_1 output of a number of infants and children varied from 1 to 2 international units per 100 cc, of three adults suffering from different diseases 2, 4, and 7 units daily, and of cases of beriberi less than 2.5 units daily.

The water-soluble B-vitamins.—V, Note on the two types of skin lesion occurring in vitamin B_2 deficiency in the rat in relation to deficiency of flavin and vitamin B_6, respectively, A. M. Copping (*Biochem. Jour., 30 (1936), No. 5, pp. 845–848*).—In continuation of investigations previously noted (E. S. R., 75, p. 137), a series of prophylactic experiments was conducted to show the specificity of flavine to an affection of the skin in which the hair is shed, type "*b*", and of vitamin B_6 to the symmetrical, florid type "*a*" appearing in rats. The basal ration contained casein 100, corn sugar 300, cottonseed oil 60, lard 15, and McCollum salt mixture (No. 185) 25 parts. The rats received daily by pipette cod-liver oil for vitamins A and D and Peters' concentrate from yeast for vitamin B_1. Those rats deprived of vitamin B_6 received 12γ of pure hepaflavine daily, and litter mates deprived of flavine 1 cc of yeast extract for vitamin B_6. This preparation had been freed from vitamin B_6 and flavine by autoclaving and treating with fuller's earth according to the method described in the previous paper. In some of the curative tests, vitamin B_6 was given as a cold alcoholic extract of whole wheat or corn prepared according to the method described by Bourquin and Sherman (E. S. R., 66, p. 410). Three litters of young rats were partially deprived of vitamin B_2 from birth by removing the yeast from the diet of the lactating mother and substituting a "—B" diet supplemented with B_1 the last week of lactation.

Of the 10 rats receiving flavine only, 8 developed the florid type *a* form of dermatitis, 1 showed symptoms of both types, and 1 had no definite skin symptoms after 14 weeks on the diet. Six rats, derived from 2 litters, were successfully cured with the administration of vitamin B_6. Only 1 rat of the third litter was cured. Of the 10 rats receiving vitamin B_6 only, 6 developed type *b*, 1 had a combination of symptoms, and 3 showed no definite skin symptoms after 14 weeks. The general condition was worse than in those of the first series. Five were cured by the administration of flavine. The 3 negative controls, of which 2 showed type *a* symptoms (rapidly cured by alcoholic extracts from corn and wheat), and 1 type *b* were cured of all symptoms by the addition of flavine and vitamin B_6.

"The results of these experiments show clearly that flavine prevents the *b* type and vitamin B_6 the *a* type of skin disorder."

Observations on the chemical method for the estimation of vitamin C, B. Ahmad (*Biochem. Jour., 29 (1935), No. 2, pp. 275–281*).—A critical study of the 2,6-dichlorophenolindophenol method of estimating vitamin C, following the

technic of Birch et al. (E. S. R., 70, p. 741), is reported, with a discussion of the conditions under which theoretically correct results may be obtained with solutions of pure ascorbic acid, natural fruit juices, and mixtures of both, and of the most satisfactory method of extracting the vitamin from fruits and vegetables.

Attention is called to the rapid destruction of vitamin C in vegetable tissues when left exposed to the atmosphere after being cut or shredded. "These points are of practical importance from the point of view of nutrition, for they show how considerably vegetables may vary in their vitamin C content according to their freshness."

Observations on the excretion of vitamin C in human urine, B. Ahmad (*Biochem. Jour., 30 (1936), No. 1, pp. 11–15*).—Using the method of Harris and Ray, the author determined the amounts of reducing substance or substances in terms of ascorbic acid excreted in the urine by persons on normal diet, on normal diet supplemented with large doses of vitamin C in the form of lime juice, and on the following diets: I, a low vitamin C diet; II, a low protein diet; III, a high protein diet; and IV, a purine-free, high protein diet. On normal diet the daily output was found to be between 23 and 35 mg of ascorbic acid, which was increased to 351.17 mg in one instance on the third day following the intake of large doses of vitamin C. On diet I the amount of reducing substances in the urine averaged 25 mg ascorbic acid, on diet II 19–20 mg, on diet III 46–65 mg, and on diet IV 14–16 mg ascorbic acid. These results indicate that a high meat diet such as III favored the excretion of vitamin C by way of the urine without increasing the intake of the vitamin.

To test the antiscorbutic value of the urine excreted on diet III, guinea pigs were fed the urine in amounts equivalent in reducing capacity to 0.5 and 1 mg ascorbic acid. The animals on both levels died of scurvy, indicating that part of the reducing action of the urine was not due to ascorbic acid. However, the toxicity of the urine was considered an important factor. The animals lost weight and looked ill after a week of feeding, causing an interference in the absorption and metabolism of ascorbic acid in the urine. These results were not, therefore, considered conclusive.

The natural reducing substances in the urine of diet III and of pure ascorbic acid in solution in the urine were studied from the point of view of their stability to heat and their reaction with lead acetate. A striking similarity in behavior was revealed between the reducing substances in the urine and pure ascorbic acid under both treatments. This evidence favored the point of view that on a high meat diet the substances reducing dichlorophenolindophenol in acid solution were in the greater part ascorbic acid.

Four tables are given summarizing the ascorbic acid values of human urine under different dietary conditions, one table summarizing the antiscorbutic value of the urine given to guinea pigs and the consequent results, and another table summarizing the relative heat stability of reducing substances in the urine and of ascorbic acid.

The behaviour of l-ascorbic acid and chemically related compounds in the animal body.—Antiscorbutic activity in relation to retention by the organism, S. S. Zilva (*Biochem. Jour., 29 (1935), No. 7, pp. 1612–1616, fig. 1*).—In this investigation 45 or 50 mg of l-ascorbic acid and a number of related compounds were introduced, under novocaine, directly into the jugular vein of guinea pigs which had been fed scorbutic diets for from 5 to 8 days. Twenty-four hr. after the injection the animals were killed and the small intestine, large intestine, liver, adrenal, and the remaining carcass were analyzed for ascorbic acid.

The guinea pigs receiving l-ascorbic acid had a vitamin C distribution among the tissues similar to that of controls fed on mixed diets. The same selective

fixation in various organs was usually found in all animals whether they obtained the vitamin from food intake or by synthesis. Two of the compounds, *d*-gluco-ascorbic acid and *d*-galacto-ascorbic acid, had no antiscorbutic activity. The *d*-arabo-ascorbic acid, ⅟₂₀ active, filled an intermediate position between *l*-ascorbic acid and the inactive *d*-gluco-ascorbic acid and *d*-galacto-ascorbic acid. The *l*-gluco-ascorbic acid was found to be less than ⅟₄₀ active. Both *d*-arabo-ascorbic acid and *l*-gluco-ascorbic acid were "fixed" in the tissues, indicating their antiscorbutic activity. The amount excreted in the urine was inversely proportional to the degree of antiscorbutic activity. This evidence was partly explained by the differential fixation of the various acids by the tissues.

"It seems that the general results justify the assumption that the antiscorbutic activity of these chemically related compounds is connected with their capacity of being 'retained' by the tissues of the animal organism."

The behavior of l-ascorbic acid and chemically related compounds in the animal body.—The influence of generalised ether anaesthesia on their urinary excretion, S. S. Zilva (*Biochem. Jour.*, *29 (1935)*, *No. 10*, *pp. 2366–2368*).—This investigation confirmed the results noted above and showed the effect of general anesthesia on urinary excretion and tissue fixation of ascorbic acid. The average urinary output of *l*-ascorbic acid was 12 mg when 50 mg was injected under local or no anesthetic and 24 mg when the same amount was injected under general anesthesia. The output of *d*-arabo-ascorbic acid was 16 mg when injection was done under local or no anesthetic and 26 mg under general, of *d*-gluco-ascorbic acid 29 and 33 mg, and of *d*-galacto-ascorbic acid 25 and 32 mg, respectively. The general anesthetic did not prevent fixation of the vitamin in the tissues as shown by values in an accompanying table.

The reversible inhibition of β-malt-amylase by ascorbic acid and related compounds, C. S. Hanes (*Biochem. Jour.*, *29 (1935)*, *No. 11*, *pp. 2588–2603*, *figs. 5*).—"In the present investigation the observation of Purr [E. S. R., 73, p. 729] that β-malt-amylase is strongly inhibited by reduced ascorbic acid has been confirmed. Moreover, evidence has been found which suggests that the effect can be attributed to the presence of the dienol grouping in the vitamin and that it is not due merely to the reducing properties of this grouping, since (1) two other dienol compounds, dihydroxymaleic acid and reductone, exert the same type of inhibition, and (2) the inhibition by a dienol compound is reversed not only by oxidative destruction of the dienol grouping but also by the addition of a variety of other reducing substances including hydrogen cyanide, sodium hydrosulfite, and several sulfhydryl compounds. This latter effect, the reversal of dienol inhibition by other reagents of a reducing character, even though the actual mechanism of this reactivation remains obscure, would seem to exclude the possibility that the effect of the vitamin and the other dienol compounds is due merely to their reducing properties.

"The results . . . thus suggest that the inhibitory action on β-malt-amylase is of the nature of a specific effect, and they accordingly lend plausibility to the view that the vitamin function of ascorbic acid may be related to its ability to function as a regulator of enzyme activity within the cell."

The effect of desiccated thyroid, α-dinitrophenol, and cortical hormone extract on the vitamin C content of some organs of the guinea pig fed graded doses of ascorbic acid, J. L. Svirbely (*Jour. Biol. Chem.*, *111 (1935)*, *No. 1*, *pp. 147–154*, *fig. 1*).—In this study guinea pigs were fed the Sherman scurvy-producing diet to which were added different amounts of ascorbic acid and, in addition in certain cases, desiccated thyroid, α-dinitrophenol, and cortical hormone extract. At definite intervals the animals were etherized, the degree of scurvy estimated, and the vitamin C content of the adrenals, liver, and spleen determined by 2,6-dibromophenolindophenol titration.

The ascorbic acid prepared from Hungarian red pepper 2 yr. previously was found to be potent. The vitamin C content of the adrenals and liver depended upon the amount of ascorbic acid fed. The amount in the spleen remained fairly constant. On the thyroid diet the vitamin C values were appreciably lower, indicating that the increased metabolism utilized more vitamin C. This diet with high ascorbic acid intake improved the general vitality and appearance of the animals. Cortical hormone extract did not prevent scurvy and required an adequate amount of ascorbic acid for its utilization. Dinitrophenol did not prevent scurvy and did not appear harmful when fed at 4 mg. per kilogram of body weight.

Antiscorbutic value of lucerne, L. F. Levy and F. W. Fox (*Biochem. Jour., 29 (1935), No. 4, pp. 884–888, fig. 1*).—Alfalfa grown in South Africa was found to be rich in vitamin C, as was shown by the reduction method of dichlorophenolindophenol and animal experiments. Young shoots and leaves were somewhat richer than when the plant reached the flower stage. The antiscorbutic value rapidly diminished when the plants were allowed to wilt and become yellow, but was only slightly altered after cooking and drying.

The prophylactic value of vitamin D irradiated and vitamin D yeast-fed milk, R. C. Eley, E. C. Vogt, and M. G. Henderson (*New England Jour. Med., 215 (1936), No. 3, pp. 110, 111*).—This study was made during the months of January through May 1935 on 26 infants from 2 to 12 weeks of age at the beginning of the study. Thirteen received irradiated milk containing 135 U. S. P. vitamin D units and 14 vitamin D yeast-fed milk containing 432 U. S. P. units per quart. Only 6 of the infants had received any antirachitic substance before the study was undertaken. The results showed that both milks protected the infants against rickets determined either clinically or by roentgen-ray examination.

Relation of rickets and vitamin D to the incidence of dental caries, enamel hypoplasia, and malocclusion in children, D. H. Shelling and G. M. Anderson (*Jour. Amer. Dental Assoc., 23 (1936), No. 5, pp. 840–846*).—Of the 276 children studied with respect to dental caries, enamel hypoplasia, and malocclusion, 126 had rickets in infancy and early childhood; 150 had received vitamin D and had not had rickets as shown by roentgen ray films. Of the first group 42, and of the second group 27, were over 6 yr. old. Evidence indicated that the incidence of dental caries was approximately the same for the rachitic group and for the group receiving vitamin D, and was greater in white than in colored children regardless of the absence or presence of rickets during infancy. Enamel hypoplasia was found more often in children with a past history of rickets, but this condition showed no relationship to caries. Malocclusion was more common in the rachitic group.

Some physiological responses to vitamin E feeding, A. J. Pacini (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 125, 126*).—This paper reports briefly the findings of over 7,000 vitamin E experiments on rats fed on a basal diet containing refined linseed oil and supplemented with vitamins A, B (complex), and D. The source of vitamin E was cold pressed wheat germ oil. Litters fathered by rats fed on vitamin E-low diets were small in number and showed a sex ratio of 80 males: 100 females. Litters fathered by rats fed on vitamin E-rich diets were normal in number and had a sex ratio of 110 males: 100 females. When both males and females were on a vitamin E-rich diet, the litters were normal in size and number and the sex ratio was 130 males: 100 females. A brief discussion of these findings pointed to a difference in viability of the sex-determining chromosomes due to nutritional changes in vitamin E in the nuclear material surrounding them.

Observation on food allergy, O. Swineford, Jr. (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 3, pp. 222–227*).—This is a general review of the causes and treat-

ment of food allergy, with special reference on the cooperation a dietitian can give in its management. A diagram shows the mechanism by which certain substances reach tissues and cause symptoms indicative of allergic disease.

TEXTILES AND CLOTHING

An improved method for converting an observed skein strength of cotton yarn to the strength of a specified yarn count, M. E. Campbell (*U. S. Dept. Agr. Circ. 418 (1936), pp. 19, figs. 5*).—The degree of variability in size of cotton yarn and the consequent need for a method of converting skein strengths to those for a specified or nominal size are discussed. The results of most spinning tests, according to a survey of literature, are converted or corrected by one of two methods, both based upon the assumption that within sufficiently wide limits skein strength and size are inversely proportional. Discrepancy between this assumption and the actual fact is demonstrated graphically. An empirical formula based upon results of more than 70 000 individual skein tests, made in cooperation with Clemson Agricultural College, by the use of which yarn strengths can be converted to those for specified sizes with due regard to the true relations of skein strength to size, is as follows:

$$S_2=\frac{C_1S_1-(C_2-C_1)(21.7)}{C_2}$$

C_1 being the observed count, C_2 the specified or nominal count, S_1 the observed skein strength, and S_2 the converted skein strength. The formula also is adapted to estimation of probable strengths of yarns of various sizes, using observed strength and size data for one particular count as a basis; it provides a means of placing test results of different spinning laboratories on the same count basis, permitting direct comparisons; and it permits economies in spinning tests by spinning only extreme counts and interpolating for mid-counts. The conversion formula can be applied also to combed yarn data with equally satisfactory results. Indications are that a formula developed by the same principle should be applicable to results of single-strand tests. A sample table, adapted to mill and laboratory use where much test work is conducted on a few counts of yarn, is shown, and alignment charts for the quick solution of the formula are presented.

Laboratory report on tests to determine causes of stretch and slippage of yarns in certain wool and silk fabrics, K. Crance, E. McFadden, and L. Fryer (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 317–339, pl. 1, figs. 11*).—Eight dyed woolen, six pure dye silk, and six weighted silk fabrics were chemically analyzed and subjected to physical tests. The weight, width, and thickness of the fabric, number of yarns per inch, yarn twist, folding endurance, and breaking strength were determined. In samples of the fabrics, plain, french, and flat-fell seams were run in both warp and filling directions. The fabrics were subjected to eight launderings, following the method given by the American Association of Textile Chemists and Colorists, and to eight dry cleanings. The above tests were repeated four times during the laundering and cleaning processes.

Laundering and dry cleaning affected elongation of the yarn in all of the test fabrics. The woolen fabrics showed the greatest shrinkage during the first two launderings. The Rajah silk sample showed practically no shrinkage after dry cleaning. In general more shrinkage was produced by the laundering methods. The silk crepe fabrics weighted with lead, tin, and a combination of lead and tin showed proportionately less shrinkage and loss in breaking strength after laundering and dry cleaning. The zinc weighted silk crepe demonstrated the least amount of shrinkage and loss in breaking strength. No

correlation was found between the amount of weighting and the stretching of the fabric. The yarns in both weighted and unweighted flat crepe, having fine filling yarns and no twist in the warp, slipped at the seams, whereas the twill weave silk fabrics broke above or below the seams. The highest breaking strength and lowest elongation were registered in the fabrics which had flat-fell seams.

The results indicate that the most important factors in increasing the slippage of yarns and elongation of the fabric are lack of balance of yarns in a fabric, a small number of yarns to the inch, lack of yarn twist, great variation in yarn count, and the seaming of fabrics.

Physical and chemical properties of some turkish towels, M. B. Hays and R. E. Elmquist (*Jour. Home Econ., 27 (1935), No. 9, pp. 587–592*).—This paper from the U. S. D. A. Bureau of Home Economics reports the various physical and chemical characteristics of 37 pairs of cotton turkish towels purchased on the Washington, D. C., retail market during the spring and summer of 1934.

The towels, which were the products of nine different mills and representative of the choice available at the time, were 22 by 44 in. in size, and cost from 14 ct. to $1.50 each. Divided into 4 types according to the ply of the ground warp and the ratio of the number of ground to pile yarns, the majority were types 1 and 4, with the low-priced towels under type 1, the high-priced ones under type 4, and medium-priced ones included in all 4 types.

All the towels were found to be plain 3-pick terry weave with the exception of 2, a rib and a novelty pattern. The usable drying surface of the same sized towels varied from 899 to 1,172 sq. in., depending upon the amount of plain woven fabric forming the border. A tendency toward longer loops, higher values for thickness, and weight per square yard were apparent as the price of the towel increased. Type 1 towels were weaker than the others in breaking and bursting strengths. The water absorption was reduced as the ply ground warps and number of threads per inch increased, resulting in a higher average absorption value for type 1 than for type 4.

There was a tendency for the higher priced towels to give a more nearly neutral pH value, indicating a careful finishing process. The towels reacting alkaline gave a low average value for their copper number and methylene blue absorptions. The average fluidity values were approximately the same for towels with an acid and an alkaline reaction.

"The physical properties of these towels tend toward higher values as the purchase price increases. Construction type 1, with the lowest average price, is also lowest in all properties except water absorption. Type 2, the next in price, is of medium weight and high in strength as well as absorption. Type 3 is high in thickness, weight, and absorption, but of medium strength, while type 4, which is low in water absorption, is high in all other properties. . . . The wide ranges found for the physical and chemical properties indicate that towels might be graded in some way similar to that used now by one large retail store in grading blankets for warmth and durability."

MISCELLANEOUS

Forty-eighth Annual Report [of Georgia Station], 1936, H. P. Stuckey (*Georgia Sta. Rpt. 1936, pp. 49, figs. 18*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Data on the ascorbic acid content of turnip greens and their juices are also included.

[Index to Wyoming Station publications], M. Lamb (*Wyoming Sta. Index Bul. H (1936), pp. 40*).—This lists all bulletins and annual reports and certain other publications of the station, and indexes Bulletins 188–217, reports 42–45, and Circular 28.

NOTES

Nevada Station.—Dr. J. E. Church, meteorologist, and Carl Elges, assistant in meteorology, represented the station at the 1936 sessions of the International Association of Scientific Hydrology at Edinburgh. An International Commission on Snow held its first meeting at that time, and Dr. Church was reelected president in preparation for a prospective meeting in Washington, D. C., in 1939.

Tennessee University.—A P. W. A. allotment of $53,181 for a three-story fireproof wing to the home economics building is announced. This will relieve existing congestion by providing new quarters for the nursery school. Jeannette Biggs has been appointed associate professor of nutrition; Marian G. Heard, assistant professor of craft design; Clara Dodson, instructor in clothing and art; and Agnes Nelson, instructor in foods and clothing.

O. Burr Ross has been appointed instructor in animal husbandry and Matthew Sexton instructor in agricultural engineering.

U. S. Department of Agriculture.—The vacancy created by the resignation as Under Secretary of Agriculture of Dr. Rexford G. Tugwell on December 31, 1936, has been filled by the promotion of Assistant Secretary M. L. Wilson. Harry L. Brown, director of agricultural extension in the Georgia College, has been appointed Assistant Secretary of Agriculture. Effective January 1, 1937, the Resettlement Administration has been transferred to the Department by Executive Order, and Dr. W. W. Alexander, departmental administrator since 1935, has been appointed Administrator.

A departmental committee on Federal-State Relations on Agricultural Activities has been established. The membership of this committee as announced under date of December 31, 1936, is as follows: Under Secretary M. L. Wilson, chairman (with R. M. Evans, alternate), M. S. Eisenhower, C. W. Warburton, Thomas H. MacDonald, W. A. Jump, J. T. Jardine, and Reuben Brigham.

Dr. Frederick V. Coville, principal botanist and acting director of the National Arboretum, died January 9. Born in Preston, N. Y., on March 23, 1867, he was graduated from Cornell University in 1887, later receiving the honorary D. Sc. degree from George Washington University in 1921. After a few months as instructor in botany at Cornell he came to the Department as assistant botanist in 1888 and was continuously associated with it thereafter. He was most widely known for his work on the domestication and improvement of the native blueberry, soil acidity as a factor in plant distribution, and the influence of cold in stimulating the growth of plants. He was also honorary curator of plants in the National Museum and connected with many other organizations. In 1903 he served as president of the Botanical Society of America and vice president of Section G (Botanical Sciences) of the American Association for the Advancement of Science.

Oberly Memorial Prize.—This prize (E. S. R., 50, p. 900) will be awarded this year in the sum of $100 for the best bibliography submitted in the field of agriculture and related sciences. Four copies of each bibliography entered should, before March 31, 1937, be in the hands of the chairman of the Oberly Memorial Fund Committee, Gilbert H. Doane, Director of University Libraries, University of Wisconsin, Madison, Wis.

EXPERIMENT STATION RECORD

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FIFTY YEARS OF FIELD EXPERIMENTS AT WOBURN

Despite their limitations, field experiments designed to test the effect upon the crop of applications to the soil have been among the earliest and most generally utilized methods of investigation in the experiment stations and other agricultural research institutions. Much thought has been given to improving their technic and to interpreting the voluminous data which accumulate during their progress. Wide differences of opinion have developed as to their intrinsic value, the length of time for which their continuation is warranted, and other details associated with their planning and management.

Enlightenment on many of these points is afforded by a recent report issued by Sir John Russell and Dr. J. A. Voelcker as one of the Rothamsted Monographs on Agricultural Science and entitled Fifty Years of Field Experiments at the Woburn Experimental Station. This volume covers the period from 1876 to 1926, and deals with an institution founded primarily to obtain authoritative information by field experimentation along closely restricted lines.

The origin of the Woburn Station had to do with the relations of landlord and tenant in Great Britain. Prior to 1870 farmers quitting their holdings, either voluntarily or at the request of the landlord, had no legal claim to compensation for any improvement which they had brought about in the soil, although allowance was frequently made on the basis of the tenant's recent expenditures for feeding stuffs. The Irish Land Act of 1870 and the Agricultural Holdings Act of 1875 established the legal principle of compensation for improvements, the latter act specifically taking into account the enhancing of fertility due to the feeding of "cake and corn."

In neither act, however, was there a definition of unexhausted value or any formula whereby the value could be determined. Sir John Lawes, then operating the Rothamsted Experimental Station, proposed an adjustment based on the composition of the feeding stuffs. A table which he prepared afforded a scientific basis for the evaluations, but it was criticized on the ground that many of his values were too high, and it did not find immediate or universal acceptance.

Field experiments, impartially conducted, were believed to be the solution of the controversy, and the Woburn Experimental Station came into being when an estate of 131 acres in Bedfordshire was offered by the Duke of Bedford and maintained by him for many years for experiments under the direction and management of the Royal Agricultural Society.

The original inquiry was limited to the manurial problem and to two feeds, decorticated cotton cake and maize meal. Sixteen acres were laid off in 4-acre plats under a four-course rotation. The cake and meal, differing widely in nitrogen content, were fed to bullocks under cover and to sheep folded on grass and clover. The manurial effects on the succeeding crops, roots after the manure and wheat after the folding, were compared with the gains from the use of artificial fertilizers supplying equivalent amounts of nitrogen and phosphorus.

Some changes were made as the work went on, but the general plan was adhered to for 50 years and as adequate a statistical analysis as seemed feasible was attempted. Unfortunately the results of this long-time inquiry proved unexpected and in many respects thus far unexplainable. Although, as the authors state, "it is universally acknowledged by practical men that cake feeding enriches the land more than the feeding of corn," "the experiments have entirely failed to show any marked superiority of cake feeding over corn feeding on this soil. . . . Much more nitrogen has gone into the land by the use of the cake than by that of corn, and yet for some reason or other it has not become available."

Thus the immediate problem of compensation to tenants has "proved more difficult than was expected, and even after 60 years of work it remains uncertain whether any rigid basis of compensation can be drawn up. In practice valuers exercise considerable discretion and judge of the fertility of the soil from the crops rather than from what the farmer has put into the land, although account is taken of this as of all other relevant considerations."

Other matters have also been studied at Woburn, and for some of these also the results have been indecisive or negative. These findings are analyzed and frankly discussed. In the words of a review in *Nature*, "one great lesson from the book under notice as a whole is the fact that the conduct of field experiments is by no means the straightforward procedure that it was thought to be at the time the Woburn experiments began. The necessity for statistical treatment of results was not thought of in those days, and consequently, even in the continuous barley and wheat experiments, the design of the experiment has been such as to limit what the statistician can do with the results. This is a fact which is fully admitted by the authors, who also point out that another lesson from these experiments is that,

once a continuous experiment has been designed, modifications at a later date should be avoided."

Still another difficulty has been the serious variation in the Woburn soils. The plan of the experiments, we are told, "was almost the perfection of the old method of single plats systematically arranged. It is admirable for demonstration of ascertained facts. Unfortunately it takes no account of differences in the nature of the soil and the subsoil; it assumes that these are equal over the whole area; it assumes also that differences resulting from different treatment of the various parts of the area prior to the commencement of the experiments will not long continue. Both assumptions are now known to be false; soil and subsoil are *not* uniform, and some of the crop results, if acceptable at all, show that comparatively small differences in treatment maintained only for a few years produce remarkably persistent effects."

In spite of these disadvantages, Sir John Russell makes it plain that many valuable results have emerged. "The general need for nitrogenous fertilizer whether the soil be light or heavy, the need for lime when sulfate of ammonia is used frequently, the fact that green manuring is by no means a trustworthy practice but is liable to break down badly even on soils where it would be most expected to do well, the serious losses incurred in using farmyard manure and in folding cake on the land—these and many other results have been definitely established. Further, a number of problems are raised of considerable interest in agricultural science and practice, and although the data, for the reasons stated above, give no clear answer, they furnish indications which subsequent experimenters will be able to utilize and to develop."

As the review points out, "in a certain sense this book is the story of failures." From a broader point of view, however, it is unexpectedly revealing and encouraging. We are still largely dependent upon empirical experiments in order to determine the effect upon the plant of any specific treatment of the soil, and much more is now known than formerly as to the conditions under which success in such experiments is probable. For these and other reasons, we may concur in concluding that "everyone interested in field experiments will be grateful for this book and for both the positive and the negative results of the Woburn experiments. They each have their value, and whatever may be the future of Woburn, the work already carried out there will certainly remain classical."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies on toxic wheat grown on soils containing selenium, M. J. HORN, E. M. NELSON, and D. B. JONES (*Cereal Chem., 13 (1936), No. 2, pp. 126–139, figs. 8*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils determined by means of feeding experiments that the seleniferous toxic principle is not appreciably soluble in water, in alcohol, or in ether, and that when the toxic wheat is milled into flour, bran, and middlings, the selenium compound is not appreciably concentrated in any one of these milling fractions. When flour from the toxic wheat was ashed at a muffle-furnace temperature which was not allowed to exceed 500° C., the ash, added to the basal diet in a preparation equivalent to 80 percent of the toxic flour, did not show a toxicity equivalent to the corresponding dosage of the flour.

Feeding experiments with the starch-free gluten from the toxic flour "indicate that the toxic principle of the flour is resident entirely in the protein fraction." The wheat contained 10 p. p. m. of selenium, the gluten 90 p. p. m. The gliadin was found to be as toxic as the gluten.

When gluten from a flour containing from 15 to 18 p. p. m. of selenium was hydrolyzed with 40 percent sulfuric acid and the dicarboxylic amino acids (glutamic, hydroxyglutamic, and aspartic acids) were isolated, this fraction, amounting to about 40 percent of the gluten, showed no toxicity in feeding experiments and no selenium content in chemical tests. By means of the butyl alcohol extraction of the monoamino-monobasic acids it was shown that the diamino acids contain little, if any, of the selenium compound. Fractional crystallization of the monoamino-monobasic acids concentrated the selenium compound in the leucine fraction (leucine with some valine, phenylalanine, and traces of other amino acids). "In one experiment, a small fraction was obtained which contained as much as 2 percent of selenium."

Other observations indicative of the nature of the selenium compound are described, in part, as follows:

"The organic selenium compound is quite stable. There are no indications of decomposition when it is heated to boiling with 35 percent sulfuric acid or 20 percent sodium hydroxide. It is apparently an organic hydrolytic product of the protein, splitting off in much the same manner as the amino acids. Like the amino acids, the selenium cannot be removed from the unhydrolyzed gluten by water, but after hydrolysis it is readily soluble in water, dilute acids, and alkalies. . . . It is insoluble in the common organic solvents such as ether, chloroform, carbon disulfide, ethyl acetate, benzene, alcohol, and acetone. Addition of hydroxylamine or sodium sulfite to aqueous solutions of the selenium-containing fractions does not throw out selenium, as happens in the case of many inorganic selenium salts.

"In general, its properties are very similar to those of the amino acids. It is precipitated along with amino acids when they are thrown down from their solutions as salts of certain metals commonly used for the precipitation of amino acids. Hydrochloric acid seems to convert the selenium compound into a form

soluble in ether. This was observed when hydrochloric acid was used to hydrolyze the gluten. Extraction of the humin with ether removed a small quantity of material containing selenium. When amino acid fractions containing selenium were esterified by heating with hydrochloric acid and alcohol, selenium was found in the ether soluble part of the esterified product. . . .

"We are not sure whether the compound has an amino and a carboxyl group. In one experiment, working with a small fraction which contained a large amount of selenium, we were able, by condensing it with potassium cyanate in alkaline solution, to obtain a hydantoin in the form of what appeared to be homogeneous crystals, which contained selenium. The formation of hydantoins is a characteristic property of α-amino acids. However, the reaction was carried out on a small quantity of material, and the experiment should be repeated and confirmed before final conclusions can be safely drawn."

Measurement of respiration in flour, E. B. WORKING (*Cereal Chem.*, 13 (*1936*), *No. 2, pp. 234–236, fig. 1*).—For the purposes of an investigation in progress at the Kansas Experiment Station, the author devised an apparatus by means of which the minute daily carbon dioxide production of a 250-g sample of flour can be determined. This is done by carrying the carbon dioxide in a current of purified air, which is first passed through a sulfuric acid solution having a vapor pressure slightly above that of the flour under investigation, into a standard solution of barium hydroxide contained in an absorption tube so constructed as to permit the temporary withdrawal at any time of a part of the absorbing solution into an attached conductivity cell, from the reading of which the quantity of carbon dioxide absorbed may be calculated.

It is noted that "the daily production of carbon dioxide per 100 g of flour at 25° C. was approximately 0.002 mg, and at 35° approximately 0.006 mg. Expressed in cubic centimeters, that corresponds to about 0.001 and 0.003 cc, respectively, of carbon dioxide produced by 100 g of flour in 1 day, a quantity too small for convenient volumetric measurement."

Varietal and regional variation in durum wheat starches, C. E. MANGELS (*Cereal Chem.*, *13* (*1936*), *No. 2, pp. 221–233, figs. 4*).—Using 0.1 M sodium hydroxide, 1.25 M potassium thiocyanate, and 4.5 M urea as cold gelatinizing reagents, and viscosity measurement methods already described by him (E. S. R., 73, p. 295), the author of this contribution from the North Dakota Experiment Station studied the behavior of the starches prepared from 12 samples of wheat representing 5 varieties of durum for the 1933 crop. The ash, phosphorus, and nitrogen contents of the purified starches were also taken into consideration, together with the susceptibility to malt diastase.

"The properties of durum wheat starches show both regional and varietal variation. There is some indication that low phosphorus content may be associated with high susceptibility to diastase, but the data are not consistent. There is a relationship between viscosity with NaOH solution and susceptibility to diastase, but viscosity with KCNS or urea solutions or with heat gelatinized preparations evidently has no relation to diastatic susceptibility. Viscosity with KCNS solution compared with viscosity of urea and heat gelatinized preparations shows significant correlation, but viscosity with NaOH solution is not significantly correlated with viscosity of other preparations."

Bound water in bread making, A. G. KUHLMANN and O. N. GOLOSSOWA (*Cereal Chem.*, *13* (*1936*), *No. 2, pp. 202–217, figs. 3*).—The authors discuss such various procedures for determining colloid bound water as the dilatometric method, methods involving calorimetry, cryoscopic methods, a refractometric method, and a polarimetric method. By special modifications they adapted a refractometric procedure to the determination of the water-binding capacity and of the actual bound-water content of flours, doughs, and breads, and they

report in some detail the comparative results obtained in their study of soybean, rye, corn, durum wheat, soft wheat, and potato flours.

The mechanism of gas production in dough fermentation, A. G. Simpson (*Cereal Chem., 13 (1936), No. 2, pp. 140–152, fig. 1*).—The author found that when the quantity of yeast used is about 2 percent, or over, on the basis of the quantity of flour, no growth occurs; that the rate of gas evolution from a dough increases steadily as fermentation progresses, the increase being the greater the lower the original percentage of yeast used; that the more rapidly yeast grows in a dough, the more rapid is the rate of gas evolution in proportion to the actual quantity of yeast present; and that "the general pheuomena of gas evolution in fermenting doughs are essentially the same as in fermenting sugar solutions supplied with yeast nutrients."

Nitrogen distribution in human placental globulin, J. S. Drage and W. M. Sandstrom (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 376, 377*).—An investigation carried out at the Minnesota Experiment Station indicates that the nitrogen distribution in placental globulin is very similar to that found by others in human serum globulin, in the globulins of normal and of colostral milks, and in the globulins of animal sera.

"This comparison is based largely upon the values for ammonia and arginine which are determined directly and with reasonable accuracy. With the exception of cystine, which is present in smaller quantities, the remaining bases also agree closely. The analysis of whole placental tissue, however, presents an entirely different picture due to other constituents."

Biological stains, H. J. Conn (*Geneva, N. Y.: Comn. Standardization Biol. Stains, 1936, 3. ed., rev., pp. 276, figs. 5*).—The present edition adds descriptions of 23 new stains to those included in the second edition (E. S. R., 62, p. 311) and continues the policy of the second edition in giving the directions for some of the more important staining procedures. A few more of these methods have been added, but their number "is limited, because of the policy of including only those methods tried by members of the Stain Commission and known to give the results for which they are intended. It is not intended even in future editions of the book to expand it into a laboratory guide in microtechnic, but to keep it primarily a description of stains and of approved staining procedures."

The physical chemistry of silver staining, L. Zon (*Stain Technol., 11 (1936), No. 2, pp. 53–67, pl. 1, figs. 2*).—In an investigation carried out at the University of Minnesota it has been shown that silver deposition plays a part in silver staining, and it was found that the rate of reduction of silver within and on histological structures is an important factor.

Some factors controlling the rate of reduction, such as the adsorption of silver hydroxide and ammonia, the affinity of silver for proteins, and the protective power of the gel structures are pointed out. Applying the information obtained to the silver staining technics, the author developed two methods, one making use of piperidine instead of ammonia, the other carrying out the reduction in the presence of the silver solution to facilitate deposition.

Soil and plant material analyses by rapid chemical methods, F. E. Hance (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 3, pp. 189–299, pls. 3, figs. 40; also Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul. 50 (1936), pp. 189–299, pls. 3, figs. 40*).—The author discusses the development of rapid chemical methods for determining nutrients available in Hawaiian soils, for the determination of nitrogen, phosphorus, etc., in cane and in sugar industry products and byproducts, and for H-ion concentration measurements (colorimetric). Rapid chemical methods for determining some components of irrigation and boiler waters are also described. The methods described are intended

to provide means whereby workers having little technical knowledge may obtain accurate results.

Toxicology of selenium.—III, Determination of selenium in air-gas-dust mixtures, H. C. Dudley (*Amer. Jour. Hyg., 24 (1936), No. 2, pp. 227–236, fig. 1*).—This investigation has shown that "gas-air mixtures containing selenium in gaseous form may be sampled and the selenium content determined by bubbling the air stream through two gas bubblers, each containing 50 cc of a mixture of 40–48 percent hydrobromic acid with 10 percent free bromine. Concentrations of 0.005 to 0.3 mg of selenium per liter of air have been determined. The method is applicable to air containing hydrogen selenide, methyl and ethyl selenide, or selenium dioxide. Sampling of dusts for selenium content and weight per unit volume of air may be carried out by approved methods. A sintered glass plate overlaid by an asbestos mat has proved satisfactory for dust sampling in determining the amount of selenium in dusts. Such a plate is used to filter air that is to be analyzed for gaseous selenium content."

The two previous papers of this series have been noted (E. S. R., 74, p. 851).

Observations on the determination of cuprous oxide as applied to sugar analysis, R. A. Stegeman and D. T. Englis (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 3, pp. 480–489*).—The authors of this contribution from the University of Illinois report a detailed comparison of gravimetric methods with methods involving quantitative oxidation by permanganate, by dichromate, and by ceric sulfate. Particular attention was given to rapidity of solution of the oxide, to its titration with various standard oxidizing agents, and to the use of some of the more recently proposed indicators. In part, the results were as follows:

"Dichromate and ceric sulfate proved satisfactory when sufficient time was allowed for complete solution of the cuprous oxide in the oxidizing agent. Direct solution of the cuprous oxide in the oxidant eliminated the possible error by atmospheric oxidation encountered in other procedures. The end point in the permanganate titration was sharpened by the use of orthophenanthroline ferrous complex as indicator, but permanganate cannot be recommended as preferable to dichromate, although recent work has shown that with care somewhat comparable results may be obtained. It is shown that the standardization of the permanganate against sodium oxalate is not the principal source of error."

"The use of barium diphenylamine sulfonate or orthophenanthroline ferrous complex as indicator for the dichromate method is suggested. The present high cost of ceric sulfate and the easy preparation of standard dichromate solutions cannot be overlooked."

Attempts to establish the accuracy of the cuprous oxide estimation by complete reduction of a standard Fehling solution were unsatisfactory. A possible explanation for the failure is suggested. Preliminary work on raw sugars indicated that although dichromate is less affected than are the other oxidizing agents, none of the oxidation methods can be successfully applied to very impure solutions. Conclusions are based on the rapidity of the analyses, as well as on the accuracy.

A colorimetric method for the detection of tea seed oil in olive oil, J. Fitelson (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 3, pp. 493–497*).—Basing his test upon the sterol content of the unsaponifiable matter in oils, the author added chloroform, acetic anhydride, and sulfuric acid to the oil to be tested. Tea-seed oil gave a brown color with green fluorescence, the olive oil a green coloration. On further adding anhydrous ethyl ether, tea-seed oil yielded a deep red color (specific), rapidly fading to light brown, whereas olive oil gave a brown color.

Comparison of methods for the detection of gelatin in dairy products, C. S. Ferguson and P. A. Racicot (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 3,*

pp. 476–480).—The authors find that "certain soured, cultured, fermented, or very old dairy products (including sour cream), with or without rennet and not containing gelatin, become cloudy or give distinct precipitates on the addition of picric acid . . . for the detection of gelatin. In every case, however, the character of these precipitates differs from that of the precipitate which picric acid produces with gelatin."

After a careful comparison with other methods they still prefer the present Official picric acid test, which, besides being the simplest, "appears to be the most accurate method for the detection of gelatin in all types of dairy products."

A colour reaction for the detection and determination of vitamin D, W. Halden and H. Tzoni (*Nature* [*London*], *137* (*1936*), *No. 3474*, *p. 909*).—The solution of the sterols must be free from all fatty substances, absolutely dry, and free from all solvents except absolute alcohol and the three named in the procedure as described. With these precautions "the solution of sterols (dissolved in benzene, petroleum ether, or chloroform) is evaporated in a test tube to about one-quarter of a cubic centimeter, and 5–10 drops of a 0.1-percent solution of pyrogallol in absolute alcohol are added. After heating on a water bath, 2–4 drops of a freshly prepared 10-percent solution of dry aluminum chloride (sublimed, 'pro synthesi') in absolute alcohol are added, and the heating is continued. If vitamin D is present, a deep violet color appears at the bottom of the test tube, reaching its maximal intensity about 4 min. after heating started. For the subsequent colorimetric determination, the product of the reaction is immediately dissolved in absolute alcohol (lilac-red colored solution), and a current of dry carbon dioxide is blown over the surface in order to prevent further oxidation. The test tube is then closed with a rubber stopper."

Cholesterol, ergosterol, and lumisterol gave no color reaction. Suprasterol II, in the same concentration as vitamin D, gave a fainter tint. A quantitative determination could be made by means of a suitable colorimeter.

Microbiological examination of dried foods, J. A. Clague (*Food Res.*, *1* (*1936*), *No. 1*, *pp. 45–59*).—This investigation of the Massachusetts Experiment Station had the object of laying a foundation for a system of methods for the bacteriological laboratory inspection of dried food products. "These experiments are presented merely to suggest a possible procedure, with the hope that much more information may be supplied by a number of laboratories and that ultimately some fairly uniform methods may be developed."

Of the results obtained in this preliminary survey it is noted, in part, that "the number of micro-organisms on dried foods varies from a few thousand per gram as a maximum on dried fruits up to several millions per gram on dried vegetables.

"Tests conducted with a small tunnel drier showed that artificial drying, or dehydration, effectively eliminated yeasts and materially reduced the numbers of bacteria and molds on dried fruits. *Esch*[*erichia*] *coli* inoculated onto the surface of grapes was destroyed by the drying process. Reduction of the numbers of micro-organisms on vegetables during the drying process was not so marked as on the fruits. In fact, dehydration did not completely kill *E. coli*, although the blanching process which ordinarily precedes dehydration was very effective in eliminating this organism.

"Types of micro-organisms found on dried foods were for the most part Gram-positive sporulating bacteria, and molds, although Gram-negative bacteria and yeasts were occasionally observed. Lactose fermenters, not of the *E. coli* type, were found in dried vegetables.

"Media suggested for a study of dried foods are plain nutrient agar, as recommended in standard methods of water analysis [E. S. R., 76, p. 293], and tomato agar for yeasts and molds.

"The methods used in the commercial dehydration of foods should produce a safe product, especially when it is considered that most of these foods are cooked before being consumed."

Microbiology of merchantable cream-style canned corn, V. M. Michael and F. W. Tanner (*Food Res., 1 (1936), No. 1, pp. 99–112*).—Of a lot of 900 cans of commercially sound corn studied at the University of Illinois, 24 percent contained viable micro-organisms. Micro-organisms to the number of 256 strains were isolated and studied. No viable cells were obtained from 28 cans showing the "hard-swell" and "flat-sour" types of spoilage. Broth cultures of 57 strains of micro-organisms isolated from corn were allowed to dry at room temperature for a period of 9 mo. At the end of this period all strains were still viable.

"The results of this investigation indicate that sound merchantable cream-style corn may contain spoilage bacteria. Whether they develop or not depends on their temperature relations and the warehouse conditions under which the cans are stored."

The cause of "black beets": An example of oligodynamic action as a contributory cause of spoilage, E. J. Cameron, J. R. Esty, and C. C. Williams (*Food Res., 1 (1936), No. 1, pp. 73–85, pls. 2*).—The blackening of canned beets is shown to depend upon the combined conditions of inadequate sterilization and the presence of an abnormally high concentration of iron in the beet juice, the bacteria surviving incomplete sterilization (*Bacillus betanigrificans* n. sp.) being unable to produce the blackening without the high iron concentration.

"This is the only known example of spoilage in canned foods which is dependent upon the oligodynamic action of a metal. . . . The function of the iron appears to be as follows: (1) The initial pH of the beet juice is increased during sterilization. (2) The iron accelerates the growth of the organism, and there is a concurrent increase in solution of iron resulting in a continuing increase in pH. (3) During the period of decline in bacterial population, and as the pH is increased, the iron affects the beet pigment, causing the characteristic result. If the pH is subsequently reduced by delayed acid-gaseous fermentation, there is a partial return of the normal red color."

Some observations on the freezing preservation of Alderman peas, H. C. Diehl, H. Campbell, and J. A. Berry (*Food Res., 1 (1936), No. 1, pp. 61–71*).—The findings noted in this contribution from the U. S. D. A. Bureau of Chemistry and Soils "are not intended to be final statements. The youth of the industry and of these investigations does not permit finality in work or conclusions." The following form a part of the numerous observations recorded:

"While the routine short scald by live steam or boiling water 93.3° to 98.9° C. (200° to 210° F.) for about 1 min. insures stability in quality of peas frozen at about 0° F., it does not appear to destroy completely such enzymes as catalase and peroxidase. Scalded peas, stored at −9.4° to −6.7° C. (15° to 20° F.), slowly develop a yellow color, without showing microbial growth. If peas are delayed before freezing, micro-organisms apparently destroy the green color by acid production. Overcooking may also cause a loss of color. Within 6 weeks raw or improperly scalded peas may develop undesirable odor and taste, even at −20.6° C. (−5° F.) storage. . . .

"Undesirable flavor changes in frozen scalded peas are noticeable soon after the detection of the odor. . . . The intensity of both generally increases as the storage period is prolonged. These observations emphasize the necessity for a better understanding of the enzymatic behavior of peas as a basis for safe and improved preservation technic in the frozen-pack industry.

"No significant histological alterations were observed in tissues of scalded peas frozen in air in a wide range of temperatures, extending from −69° to −6.7° C. (−92° to 20° F.). . . .

"No marked alterations in the dry matter, carbohydrates, and ether extract resulted from the scalding of peas by live steam or boiling water for the customary short periods already indicated. Freezing storage of scalded peas packed without liquid at −20.6° and −6.7° C. (−5° and 20° F.) for a period of almost a year had practically no effect on the dry matter, starch, total sugar, acid hydrolyzable polysaccharides, and ether extract. Freezing storage of scalded peas packed in 2 percent sodium chloride brine at −20.6° and −6.7° C. (−5° and 20° F.) resulted in considerable losses in dry matter and total sugar, amounting to approximately 15 percent of the former and about 40 percent of the latter, calculated on a fresh weight basis.

"Bacteriological studies show that shelled raw peas may harbor 1,000,000 micro-organisms per gram, and that after about 6 hr. at 21.1° C. (70° F.) the number increases rapidly. While scalding at 93.3° to 98.9° C. (200° to 210° F.) for 1 min. kills some 99 percent of the microbial flora, scalded peas permit very rapid growth of survivors and spoil fully as readily as raw peas. Microbial growth in both raw and scalded peas is largely prevented for 48 hr. by a temperature of 0° C. (32° F.). The lower limit for microbial growth appears to be between −9.4° to −6.7° C. (15° to 20° F.). The usual storage temperature for frozen-pack peas of about −17.8° C. (0° F.) reduces the microbial population greatly in a few months."

The preservation of grape juice, I, II (*Food Res., 1 (1936), No. 1, pp. 9–27, figs. 2; 87–97*).—Two contributions from the New York State Experiment Station are noted.

I. *Pasteurization of Concord grape juice*, C. S. Pederson. The author studied the pasteurization temperatures needed to prevent spoilage by micro-organisms, together with certain other preventive precautions to improve the quality of the juice.

"Relatively few organisms, primarily molds and bacteria, survive the heating of Concord grapes for extraction. A large number of organisms are introduced in the pressing operations. These apparently are not the result of growth in the juice but are due to contamination from equipment. These organisms, which are mainly yeasts, are apparently more resistant to heat than the yeasts natural to the grape. All organisms are killed in the pasteurization before filling carboys. The juice in carboys is occasionally spoiled by mold growth. The source of this contamination may be mold spores on the corks used for closure or mold spores on corks which had been pushed into the carboys when previously used. The latter source of contamination can be overcome only by removal of these corks. The former may be overcome by dipping the corks in hot paraffin immediately before use."

The author's investigations have shown that Concord grape juice can be pasteurized successfully with ordinary precautions "at temperatures considerably lower than those used at present in the industry or in the home. A temperature of 71.1° C. (160° F.) is apparently sufficient, although 73.9° to 76.7° C. (165° to 170° F.) would be safer, especially for carboy juice made from Concord grapes. The majority of yeasts and bacteria are killed at temperatures well below 62.8° C. (145° F.). The molds are more resistant but are apparently unable to withstand temperatures much above 68.3° C. (155° F.)."

Lower temperatures used in pasteurization improve flavor, aroma, and color, retard precipitation in the juice, and apparently have other advantages.

II. *Factors controlling the rate of deterioration of bottled Concord juice*, D. K. Tressler and C. S. Pederson.—Further work has shown that pasteurized Concord grape juice stored under a high vacuum or in bottles containing substantially no oxygen undergoes very little change even when exposed to light

at room temperature. The juice in partially filled bottles deteriorated rapidly. The changes noted were the clouding of the juice, a change from bright purple red to a brown color, a slow deposition of a brown sediment leaving an amber colored juice, and a loss in aroma and flavor. These changes occurred more rapidly at room temperature than at lower temperatures, and light, particularly that of short wave length, accelerated them. It is shown that commercially bottled grape juice has been subject to the oxidative changes described because the air has not been eliminated from the bottle. It was also found that Concord grape juice which has never been heated does not keep well even though it is sterile and kept in absence of oxygen.

Heating at 73.9° C. (165° F.) for 30 min. is shown to be sufficient to destroy the micro-organisms in the juice, so that it will keep satisfactorily in bottles containing little or no oxygen in the head space. The juice appeared to keep equally well in soft glass, hard (resistance) glass, and Pyrex glass containers.

Vacuum determination in all-glass canning jars, W. A. MACLINN and C. R. FELLERS (*Food Res., 1 (1936), No. 1, pp. 41-44, fig. 1*).—An investigation carried out at the Massachusetts Experiment Station has resulted in the development of two satisfactory methods for the determination of the degree of vacuum in glass-packaged food products.

In the first of these methods, "a large vacuum desiccator . . . is connected with pressure rubber tubing to a vacuum pump. The connections should be tight so that a vacuum of 27 to 29 in. can be attained. An ordinary Chapman water pump attached to a laboratory water faucet will usually answer the purpose. The jar of food with clamps removed is immersed in an open glass vessel which contains sufficient water to cover the jar. The vessel with the jar inside is placed within the desiccator, the lid of the latter replaced, and the stopcock opened. A vacuum gage is connected in the line to indicate the vacuum. All connections must be gastight. The air is slowly exhausted. When the vacuum inside the desiccator exceeds that in the jar, the glass cover will lift a little, allowing bubbles to escape. The vacuum gage is read at this instant.

"Jars to be examined should be run through this process before the rubber ring adheres to the cover too tightly, since the rubber rings on jars of fruit which have been canned for a long time are often difficult to remove."

In the second, or "water-displacement method", the jar "is weighed after processing. This weight includes the complete container and contents. The jar is then immersed in water in an inverted position and the seal broken, which permits the head space to fill with water in proportion to the vacuum in the head space. Still holding the jar inverted, the water levels inside and outside the jar are made the same, the cap is replaced, the clamps tightened, and then removed from the water, wiped off, and reweighed. The difference in weight between the second and first weighing gives the amount of water which is sucked in. The lid is then removed and the jar completely filled with water, including the volume under the glass cover. This weight minus the first weight gives the volume of head space, and from the weight of water sucked in, the vacuum can be calculated."

AGRICULTURAL METEOROLOGY

The 334-year cycle for meteorological forecasts [trans. title], A. AURIC (*Compt. Rend. Acad. Sci. [Paris], 202 (1936), No. 26, pp. 2169, 2170; abs. in Sci. Abs., Sect. A—Phys., 39 (1936), No. 465, p. 952*).—The author concludes that meteorological phenomena are very largely influenced by three periods—annual, lunar, and sunspot—all included in the 334-yr. cycle, and that this period,

both astronomically and meteorologically, has advantages for predictive purposes over other periods suggested.

Sunspots and weather forecasting in Canada, A. Thomson (*Jour. Roy. Astron. Soc. Canada, 30 (1936), No. 6, pp. 215–232, figs. 6*).—From studies extending over many years, the author concludes that "variations in the period and amplitude of sunspot fluctuations are so great that the number of sunspots present a year or so in advance cannot be accurately forecast. Hence seasonal weather forecasts based on sunspot numbers are unreliable." He states that "precipitation, temperature, and cloudiness at stations along the southern border of Canada and thunderstorms at Toronto may be affected by variations in sunspots, but records extending from 30 to 80 yr. at these stations are not sufficiently long to show it. Temperatures over the prairies are possibly slightly lower during years of sunspot maximum, but yearly values in any cycle show a random scatter about the mean. The temperature and rainfall departure at any station for a particular year of the sunspot cycle varies so irregularly from the mean from one cycle to another that it is without value to attempt to use the sunspot variation curve for forecasting weather at stations in Canada."

Climatic maps of North America, C. F. Brooks, A. J. Connor, et al. (*Cambridge, Mass.: Harvard Univ. Press, 1936, pp. [3], maps 26; abs. in Econ. Geogr., 12 (1936), No. 3, p. 324*).—Twenty-six climatic maps covering temperature, pressure, precipitation, snowfall, humidity, cloudiness, and frequency of thunderstorms, prepared for Köppen's Handbook of Climatology, are given with descriptive notes on each. The reviewer says: "The value of the publication extends far beyond the actual field of climatology; it may be regarded as an outstanding contribution to the geographical knowledge of the North American continent."

The light climate of woodlands, E. J. Salisbury (*Ber. Schweiz. Bot. Gesell., 46 (1936), Festband Rübel, pp. 1–11, figs. 8*).—From data obtained with two types of photoelectric recorders, one using cuprite cells and the other selenium cells (of which the former proved superior to the latter for measurement of light of photosynthetic significance in woodland growth of various kinds and density), the author concludes in general that "vegetation that occupies areas where the light intensity is low usually consists of evergreen or wintergreen species that probably rely on the higher light intensity during the beginning and still more towards the end of the 'light phase' to carry on their chief assimilatory activity. During the 'shade phase' these species may perhaps be working at or below the compensation point."

It is stated that the studies showed not only "the fundamental quantitative differences in illumination which are encountered in the light phases and shade phases, respectively, of one and the same community and the striking differences of light conditions between different woodland communities, but also [demonstrated] the significance of such biological features as the periods of assimilatory activity, the height of assimilating surfaces, and the importance of the spatial structure of the canopy as affecting the frequency and duration of sun flecks."

Agricultural meteorological studies, J. W. Hopkins (*Canada Natl. Res. Council Ann. Rpt., 18 (1935), pp. 29, 30*).—This article deals with studies of weather and wheat yield in western Canada, relation of weather to protein content of wheat, and studies of evaporation as affected by varying meteorological conditions.

On the more fertile soils no statistically significant correlation was found between preseasonal precipitation and yield of wheat. On both the stubble and fallow plats of the fallow-wheat-wheat rotation, however, increased precipitation during the autumn, winter, and spring months was associated with increased

yield. The maximum effect of additional rain occurred during June. There was a significant negative correlation between rainfall in the growing season and the nitrogen content of Marquis wheat. The main effect was observed during May and June, probably due to the fact that additional moisture at this time stimulates vegetative growth and thus increases production of carbohydrates. Above-average temperatures during July and August were associated with the higher nitrogen content, suggesting that the effect of elevated temperature is to increase the loss of carbohydrates from the developing grain by respiration. Variations in evaporation were found to be correlated with temperature differences with a significant additional effect of wind and humidity.

Influence of meteorological factors on the growth of common clover and different pasture grasses [trans. title], G. NILSSON-LEISSNER (*Landtmannen, 19 (1935), No. 36, pp. 816, 817, figs. 2; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 4, pp. 636, 637*).—Observations on the influence of temperature, humidity of the air, rainfall, and drought on the growth of red clover alone and in mixtures with certain pasture grasses such as redtop, red fescue, and timothy indicate that high temperature during June reduced the yield and increased it during August, these effects being more marked with clover alone than with mixtures of clover and the grasses. High humidity of the air was favorable to growth during June, but unfavorable during August. High rainfall was not unfavorable during June or August, but was of great value during July. Dry weather was not unfavorable to the grasses during June or to clover during July, but in August it was without effect. In general the results showed the advantage of a mixture of clover and pasture grasses as a means of resisting drought.

***Correlation analysis of temperature and moisture in extremely different* soils and in the air near the soil** [trans. title], W. KREUTZ and M. ROHWEDER (*Deut. Reichsamt Wetterdienst, Wiss. Abhandl., 1 (1936), No. 9, pp. 20, figs. 18*).—This is a very technical, mathematical, and graphic study of available facts regarding temperature and moisture in relation to development of plant and animal life and its adjustment to physical environment, especially temperature and moisture, and protection against unfavorable conditions in crop production.

The authors conclude from their study that by means of correlation and performance calculations such as they propose in this article, it will be possible to make predictions of value to practical agriculture and horticulture. It should thus be possible to arrive at indications with regard to critical temperatures at the time of planting; the penetration of frost into the soil; climatic improvements in the open field, under glass, and in the greenhouse; the possibility of the culture of high-value plants, and like matters within the field of agricultural meteorology.

Droughts in the United States (*U. S. Dept. Agr., Weather Bur. Rpt. 1936, pp. 12–14*).—Data are given regarding long-period and transitory droughts in the United States. Two comparable long-time drought periods are especially considered, 1886-95 and 1930-36. Reference is also made to earlier drought periods. It is stated that the few available precipitation records covering 100 yr. or more indicate that a general dry period somewhat comparable with that of 1886–95 and the more recent one of 1930 to date occurred in the thirties of the last century, or approximately 100 yr. ago. Tree-ring records indicate a dry phase within the period 1755–80. An outstanding wet phase of climate in the United States in the last century occurred from about 1865 to 1885, with a secondary maximum during the first two decades of the present century. "While study of long weather records has not as yet disclosed a law sufficient to justify a forecast of future droughts, such study does give an

historical background which warns us that droughts in future may be expected just as severe as those in the past."

Frost penetration as affected by weather and snow conditions, H. U. FULLER (*Jour. New England Water Works Assoc., 50 (1936), No. 3, pp. 299–301*).—Observations at 6-in. intervals, down to a depth of 5.5 ft., with thermometers in pipes are reported. From these observations it is expected to determine the rate at which the frost line goes down in the soil in early winter and rises in late winter. Some preliminary but incomplete observations are recorded.

SOILS—FERTILIZERS

Soil science: Its principles and practice, W. W. WEIR (*Chicago: J. B. Lippincott Co., [1936], pp. [XI]+615, figs. 134*).—This book consists of the following chapters: Development of agriculture and rise of scientific thought, physical constitution of soils, physical properties of soils, chemical nature of soils, microbial population of soils, the modern concept of soils, soil classification, natural order in soils, soil and plant relationships, crop production and soil fertility, tilth and tillage, soil water and soil fertility, irrigation and land drainage, aeration as a factor in soil fertility, soil reaction and soil fertility, soil acidity and soil alkalinity, science and art of liming acid soils, organic matter and soil fertility, micro-organisms and soil fertility, plant nutrient elements, fertilizers, fertilizers—their effects on soils and plants, fertilizing plants to meet their nutrient requirements, crop rotation and soil fertility, soil erosion, determining the need for fertilizers, and interpreting results of fertilizer experiments. The author calls attention to the fact that illustrations of the more important soils of the world, and especially colored prints of profiles, such as those included in the present work, are likely to be "of great assistance in the study of all phases of soil science."

[Soil investigations of the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 9, 41, 42, 43*).—Brief notes are given on control of excessive soil nitrates, microbiological tests for available plant nutrients, and nature of microbiological activities in slick spot soils.

[Soil and fertilizer notes, Texas Station] (*Texas Sta. Rpt. 1935, pp. 57, 58, 78, 217*).—The report contains data on the comparison of nitrogen fertilizer materials and polyhalite as a source of potash for fertilizers, both by E. B. Reynolds; and preliminary studies of artificial plats for field experiments, by H. F. Morris.

Soil survey of Lauderdale County, Alabama, A. L. GRAY ET AL. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 26, pp. 43, figs. 2, map 1*).—Lauderdale County consists of 444,160 acres in northwestern Alabama, of which area about 60 percent has a surface relief favorable for agricultural operations. For drainage the county is dependent upon the Tennessee River and its tributaries. Certain areas of first bottom lands "and the numerous sinks and depressions, the latter being conspicuous features of the landscape," are ill drained.

The soils found in this survey, made in cooperation with the Alabama Department of Agriculture and Industries, are listed as 14 series inclusive of 19 types and various phases. Dewey loam covers 14.9 percent of the county, Dickson gravelly silt loam 11.6, Dickson silt loam 11.1 percent, and Dewey gravelly loam 10.5 percent. Guin soils, undifferentiated, 11.7 percent, form the largest single group in a total of about 25 percent of the county which was found too rough, steep, and broken for farming operations but usable advantageously for forestry.

Soil survey of the Roswell area, New Mexico, W. G. HARPER (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt], Ser. 1933, No. 2, pp. 34, figs. 2, map 1*).—The Roswell area, comprising 188,800 acres, in Chaves County, is situated in the Pecos Valley in the southeastern part of New Mexico, and includes in part an area previously surveyed (E. S. R., 12, p. 522). It includes principally the recently accumulated soils that have been deposited on river flood plains of the stream bottoms and which have not undergone much profile development, and upland soils that have been developed on alluvial fans formed by meandering streams and surface flood waters, which show characteristics of soil-building processes under warm arid or semiarid conditions. Drainage, either natural or artificial, is good in most of the area, although some large bodies of soils are poorly drained and are affected by alkali. Irrigation is required.

The soils of the area were found to constitute 6 series in which are included 20 types. Reeves loam totaled 24.2 percent of the area, the clay loam of the same series 18.2 percent, and its chalk 11.7 percent. Reagan clay loam was found to the extent of 10.6 percent. Five varieties of unclassified material amounted altogether to 5.2 percent.

The survey was made in cooperation with the New Mexico Experiment Station.

Composition of some Alberta peats, K. H. WALKER (*Sci. Agr., 16 (1936), No. 9, pp. 499–502; Fr. abs., p. 502*).—Analyses of a number of samples of Alberta peats in the vicinity of Edmonton, sampled according to profile layers, indicated generally low plant food reserves in Alberta "muskeg" lands. It was found, however, that "many of the peat samples were very rich in calcium, varying from 0.66 to 6.67 percent with the majority falling between 2 and 4 percent. The lower horizons were generally richer in calcium than the upper ones. The surface horizons were generally acid, having in some cases pH values as low as 3.8. However, in two of the profiles the surface horizons had pH values above 7. The lower horizons were in general less acid than the upper ones. The total nitrogen in these peats varied from 0.46 to 2.9 percent, with the majority of the samples falling within the range of from 1 to 2 percent. On the average, the nitrogen content of Alberta peats is probably not quite as great as that of peats in some other parts of Canada, the United States, and western Europe. The phosphorus content of the Alberta peats was extremely variable, ranging from 0.02 to 0.12 percent. The potassium content was small, ranging from 0.01 to 0.1 percent."

Capillary conductivity measurements in peat soils, L. A. RICHARDS and B. D. WILSON (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 427–431, figs. 2*).—The authors of this contribution from the [New York] Cornell Experiment Station report upon the elaboration of an apparatus of improved design and upon its use in measuring the capillary conductivity of water in peat soils. A description of the apparatus is given, and photographs showing its arrangement are reproduced.

"At low tensions the soils were found to possess capillary conductivities greater than those that have been reported for mineral soils. However, the capillary conductivity was found to become zero at lower tensions in the two peat soils studied than has been reported for mineral soils. Difficulty was experienced in measuring the capillary conductivity of peat soils because of the length of time required for the moisture content of the soils to reach an equilibrium value at a given capillary tension."

Directions for making mechanical analyses of soils by the hydrometer method, G. J. BOUYOUCOS (*Soil Sci., 42 (1936), No. 3, pp. 225–229, pl. 1*).—In a further investigation carried out at the Michigan Experiment Station, the

author has made his hydrometer method (E. S. R., 57, p. 710) more convenient and in several respects more accurate than it was in its original form.

"A new type of dispersing machine . . . is now used, which is more convenient, less noisy, more durable, and more efficient than the original mixer. A new hydrometer has been made which has a streamlined bulb, comes to equilibrium quicker, and is more accurate at the lower range of the scale than was the original hydrometer. A new cylinder without lip is now used. This affords a better contact and consequently a better sealing between the palm of the hand and the mouth of the cylinder when the soil suspension is being shaken. The cup has been improved in a few minor details. Several minor changes in the techine add to the accuracy of the method."

Dispersion of soil for mechanical analysis by sodium carbonate or sodium oxalate treatment, A. N. Puri (*Soil Sci., 42 (1936), No. 4, pp. 267–272*).—The proposed method "consists in the estimation of exchangeable Ca and free acidoid, sodium carbonate or oxalate equivalent to the former and sodium hydroxide equivalent to the latter being subsequently added and the soil suspension shaken overnight.

"To attain maximum dispersion, soils rich in organic matter require boiling with H_2O_2 or ammonium carbonate in addition to the foregoing treatment.

"It is obvious that soils containing excessive amounts of soluble salts or gypsum cannot be dispersed by any single treatment, for the salts will appear as clay even if the soil does not become flocculated. Such soils must be first leached with water to rid them of soluble salts and then shaken with $BaCO_3$ to make the calcium sulfate ineffective."

The applicability of alkaline permanganate for oxidation of organic matter in soils for mechanical analysis, J. N. Chakraborty (*Soil Sci., 42 (1936), No. 4, pp. 261–266*).—A method of mechanical analysis using alkaline permanganate for oxidation of organic matter has been shown to yield results comparable with those given by the International-A method "in the case of various Indian soils, e. g., ordinary arable, forest, gypseous, peat, and lateritic soils. Thus the method appears to be a general method for mechanical analysis of soils. This is particularly suitable for soils rich in organic matter and is recommended for use in tropics where hydrogen peroxide is not very stable. Alkaline permanganate requires only a short time for oxidation of organic matter.

"Soils containing gypsum should be passed through a 70-mesh sieve to remove coarse gypsum after oxidation with alkaline permanganate and before addition of hydrochloric acid."

Behavior of polyvalent cations in base exchange, J. E. Giesekind and H. Jenny (*Soil Sci., 42 (1936), No. 4, pp. 273–280, figs. 7*).—At the Missouri Experiment Station "a study has been made to ascertain the role of mono- and polyvalent cations in base-exchange reactions with Putnam clay. Although the behavior of the ions is irregular, it appears that the electric charges and the sizes of the ions are two of the major factors which determine the position of an ion in the adsorption and release series."

Influence of soil management on some physical properties of a soil, R. S. Stauffer (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 900–906, fig. 1*).—The author of this contribution from the Illinois Experiment Station investigated the relative effects of continuous corn, with and without fertilizer treatment, and of a corn, oats, and red clover rotation on organic carbon content and on various physical constants of the soils of plats kept under these respective methods of management since 1904.

"In the 0- to 6⅔-in. layer of the soils included in this study, . . . the unfertilized continuous corn plat has the lowest organic carbon content, the lowest moisture equivalent, the highest dispersion and erosion ratios, the lowest

water-holding capacity, and, with one exception, the slowest rate of percolation. . . . [Continuous corn with manure, lime, and rock phosphate treatment] showed a slightly slower rate of percolation after the soil had been saturated with water for 1½ hr. In this same layer of soil . . . the corn, oats, and clover plat on which fertilizer and lime have been used has the highest organic carbon content, the lowest dispersion and erosion ratios, the highest water-holding capacity, the most rapid rate of percolation, and the highest moisture equivalent except the grass border, which has a slightly higher moisture equivalent. In the 6⅔- to 13⅓-in. layer of soil, the results are quite different than in the surface layer. The unfertilized corn plat has a relatively low dispersion ratio and permits the most rapid percolation of water. The results . . . indicate that the same is true for the unfertilized corn, oats, and clover plat in this same layer of soil.

"In the 13⅓- to 20-in. layer of soil, the unfertilized corn plat occupies the same position among the different samples as in the surface layer, except that it has a relatively high moisture equivalent. This may be accounted for by the fact that it contains a higher percentage of material of the size of clay and finer. The fertilized corn plat has a relatively low dispersion ratio in this layer of soil. No reason for this is apparent at this time.

"Poor systems of cropping and soil treatment are not only accompanied by rapid declines in crop yields and a decrease in plant nutrients but also by changes in the physical condition of the soil. In the surface soil especially those changes are undesirable. It appears from the results reported here that soils on which poor cropping systems have been followed, and there are many such areas in Illinois, are much more subject to destruction by erosion than soils on which good systems have been followed. The results also indicate that good physical condition of a soil, such as the one studied here, can be maintained if good systems of cropping and management are followed."

Properties of the hydroxyl groups of clay as a basis for characterizing a mineral soil, W. Thomas (*Soil Sci., 42 (1936), No. 4, pp. 243–259, figs. 3*).—In an investigation reported from the Pennsylvania Experiment Station the author has shown that "by the treatment of a soil with increasing amounts of solutions of hydrochloric acid and also of barium hydroxide in low concentrations, differences in specific properties of the three types of hydroxyl groups of clays may be used as a means for the rapid characterization of a soil with respect to the degree of unsaturation, the total replaceable bases, the 'free' aluminum and iron hydroxides, the phosphoric acid required to satisfy the Al and Fe, the lime requirement, the availability of the different states of the replaceable potassium, and the changes produced by cultivation and fertilizer treatment."

The dilatometer method as an indirect means of determining the permanent wilting point of soils, G. J. Bouyoucos (*Soil Sci., 42 (1936), No. 3, pp. 217–223, pl. 1*).—The author of this contribution from the Michigan Experiment Station adds 5 cc (to a sand sample) or 10 cc (to a loam, clay loam, or clay) of water to 20 g of the air-dry soil in a dilatometer having a bulb of 60-cc capacity, fills the remaining space with ligroin, freezes the free water by placing the dilatometer in a bath having a temperature of −10° C. for about 25 min., and then places the dilatometer in a bath having a temperature of −1°.

"The final reading, after freezing, is recorded, and from this reading is subtracted the first reading before freezing. The difference is the number of cubic centimeters of the added water that froze. By subtracting this latter amount from the amount of water that was added to the soil, one obtains the quantity of water that failed to freeze. To the latter is added also the hygroscopic water. This total amount of water is divided by the amount of soil used on

the oven-dry basis, which gives the total percentage of water that failed to freeze at −1°, which is considered to be the permanent wilting point of the soil."

Unproductiveness of certain orchard soils as related to lead arsenate spray accumulations, S. C. Vandecaveye, G. M. Horner, and C. M. Keaton (*Soil Sci., 42 (1936), No. 3, pp. 203–215, pl. 1*).—A contribution from the Washington Experiment Station reports upon accumulated soluble arsenic compounds as the primary cause of unproductiveness in certain Yakima Valley soils from which old apple trees had been removed. The authors consider that soluble lead compound, "if liberated in sufficient concentration from the accumulated spray compounds in the soil, may be a contributing factor."

It was found that "soil samples obtained from the surface 6 in. of a number of unproductive fields contained from 4.5 to 12.5 p. p. m. of readily soluble arsenic calculated as As_2O_3. The poor condition of young alfalfa and barley in the affected fields seemed to be roughly in proportion to the concentration of readily soluble arsenic in the surface soil. The symptoms of toxicity of barley grown in the greenhouse in pots filled with untreated soil taken from the surface 6 in. in two unproductive fields were identical with those observed in the field. The arsenic content of samples of tops and roots of this barley harvested at the blooming stage of maturity ranged from 10.01 to 17.5 p. p. m. of As_2O_3 in the tops and from 788 to 1,640 p. p. m. in the roots. Only traces of PbO were found in the tops, whereas in the roots the amounts ranged from 662.5 to 756 p. p. m.

"Samples of soil free from accumulations of readily soluble arsenic and lead, and treated with various amounts of arsenious acid and lead nitrate, respectively, were used for greenhouse culture work. The toxic symptoms of the barley plants growing in samples containing readily soluble arsenic equivalent to 5 p. p. m. or more of As_2O_3 at planting time were identical with those observed on barley in the affected fields. Retardation of growth occurred, though no definite toxic effects on barley seemed to result in soil samples receiving more than 50 p. p. m. of lead nitrate."

Reclamation of alkali soils by electrodialysis, A. N. Puri and B. Anand (*Soil Sci., 42 (1936), No. 1, pp. 23–27, fig. 1*).—In an investigation reported from the Irrigation Research Institute, Lahore, India, the authors applied the principle of electrodialysis for the removal of exchangeable bases to the reclamation of alkali soils. "Preliminary experiments . . . show that exchangeable sodium as NaOH can be removed from soil on a field scale by the application of electric current, resulting in a marked reduction in the exchangeable sodium of the soil thus treated."

Soil microbiology, S. A. Waksman (In *Annual Review of Biochemistry, V*, edited by J. M. Luck. *Stanford University, Calif.: Stanford Univ. Press, 1936, vol. 5, pp. 561–584*).—This review takes up in turn the nature of the soil population, autotrophic bacteria; nonsymbiotic and symbiotic nitrogen-fixing bacteria; cellulose- and hemicellulose-decomposing and other heterotrophic bacteria in the soil; *Actinomyces* and fungi in the soil; soil fungi causing plant diseases; mycorrhizas; algae, protozoa, and nematodes in the soil, the decomposition of plant and animal residues; mutual relationships between root systems of higher plants and micro-organisms; and the influence of environment on the activities of soil micro-organisms. The literature list contains 165 entries.

Apparatus for the measurement of CO_2 evolved during the decomposition of organic matter in soils, B. N. Singh and P. B. Mathur (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 423–426, figs. 2*).—The apparatus described is designed to permit the collection and determination of the carbon dioxide evolved from a sample amounting to 50 g of the dry soil, the sample as placed in the

apparatus containing from 20 to 25 percent of moisture added as distilled water. A 500-cc bulb is used as the soil chamber. The apparatus provides for the withdrawal of a sample of the gas content of the soil bulb, the measurement of the decrease in pressure in the bulb after the sample has been withdrawn, measurement of the volume of atmospheric pressure of the sample taken, and measurement by difference after absorption of the carbon dioxide in potassium hydroxide solution of the carbon dioxide content of the gas sample. From these data the total volume of gas in the soil bulb and its content of carbon dioxide are calculated. The drawing (not dimensioned) indicates the parts required and their arrangement.

It is noted that "the data indicate that a rise in the concentration of CO_2 beyond 4 percent will result in a distinct depression in the rate of CO_2 production from the soil. Evidently the interval after which the CO_2 concentration will rise above 4 percent will depend upon the rate of CO_2 production from the soil, as also upon the soil: gas-space ratio in the soil chamber. With samples having a high rate of CO_2 production smaller amounts of soil should therefore be used."

Biological processes in tropical soils, A. S. Corbet (*Cambridge, Eng.: W. Heffer & Sons, 1935, pp. XIV+156, pls. 16, figs. 10*).—"This book was written primarily for agricultural chemists working in tropical countries, but it is hoped that planters, foresters, and others may find it intelligible and useful. It is, perhaps, as well to point out that the author has, of necessity, viewed the subject largely from the standpoint of the cultivation of a perennial crop, namely rubber. It may be sugegsted that some of the matter included is to be found in standard textbooks. This is so because many well-known works of reference are not always to be found in tropical laboratories. For this reason it has been thought advisable to include standard methods of soil analysis in the appendix." The chapter headings are as follows: Malaysia, the plant life of Malaysia, the soil fauna, soil micro-organisms, the bacterial growth curve, the soil organic matter, the nitrogen cycle, Jenny's law, and some practical considerations. These chapters are followed by an appendix containing "standard methods employed for the examination of soils, classification of bacteria, classification of fungi, conversion factors, bibliography." The book contains also an author index, a subject index, an index to animals, and an index to plants.

The rate of decomposition of various plant materials in soils, H. C. Millar, F. B. Smith, and P. E. Brown (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 914–923, figs. 3*).—The authors report upon an investigation, carried out at the Iowa Experiment Station, in which a preliminary comparison of two methods for the determination of carbon dioxide production was made, and the rate of decomposition of 12 plant materials containing about the same amount of carbon but varying widely in percentage of nitrogen was determined by measuring the production of carbon dioxide in Dickinson fine sandy loam treated with the various materials.

The aspiration method for measuring carbon dioxide production was found to give higher results than the respiration chamber method during the first part of the experiment, but after 624 hr. the quantities of carbon dioxide evolved from the soils treated with the same kind of organic matter were about the same by both methods of determination. The results obtained indicated that all of the carbon dioxide was being absorbed by the respiration chamber method, and this method was found to require less time and equipment than the aspiration method.

"The plant materials high in nitrogen decomposed more rapidly during the first few days of decomposition than the plant materials low in nitrogen. After this initial period of decomposition the materials low in nitrogen decomposed

more rapidly than the materials having a high nitrogen content. The decomposition of plant materials high in nitrogen resulted in a greater fixation of carbon in the soil than the decomposition of materials with a low nitrogen content. This was evidenced by a decreased total carbon dioxide evolution from the soils treated with the plant materials containing a relatively high nitrogen content."

Field characteristics and partial chemical analyses of the humus layer of longleaf pine forest soils, F. Heyward and R. M. Barnette (*Florida Sta. Bul. 302 (1936), pp. 27, figs. 8*).—Repeated fires in longleaf pine resulted in a type of humus layer more typical of grassland than of forest. When fire was excluded for 10 yr. or more, a distinctly different type of humus developed with characteristics intermediate between mull and moor. In the fire protected forest, intense animal activity occurred in the underlying mineral soil to a depth of from 2 to 3 in., with the result that the soil became extremely porous and penetrable. A period of from 8 to 12 yr. appeared necessary for the establishment of an approximate balance between accumulation and decomposition of the forest floor. With 10 yr. or more protection, a total forest floor of from 20,000 to 50,000 lb. per acre may accumulate, after which little or no accretion occurs. Litter and F layers were characterized by an extremely wide carbohydrate: nitrogen ratio, the first being 100.7±4.39 and the other 47.0±2.43. The organic layers in the longleaf pine region are relatively low in nitrogen and calcium. New factors of 1.909 and 1.882 are proposed for obtaining percentage of organic matter from percentage of carbon in litter and F layers, respectively. The humus layer on protected areas appeared to be essentially a healthy soil condition. There is a fairly rapid decomposition of organic matter with no tendency toward the development of raw humus and the accompanying degradation.

The behavior of lignin and humic acid preparations toward a bromination treatment, I. C. Feustel and H. G. Byers (*Soil Sci., 42 (1936), No. 1, pp. 11–21*).—The authors report upon an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils, in part, as follows:

"The lignin and humic acid preparations studied in this investigation had similar properties to the extent that they were each soluble in sodium hydroxide solution and were precipitated by dilute hydrochloric acid. The bromination treatment, however, has served to distinguish sharply not only between the lignin as compared with the humic acids but also among the individual humic acid fractions. The conditions of bromination were arbitrarily fixed as to quantity of bromine and water, temperature, and time of treatment. A variable product results from the treatment under varying conditions. . . .

"Differences in character of the different preparations were most clearly and consistently illustrated by the proportions of organic matter dissolved during the bromination treatment, by the relative quantities of ether-soluble matter produced, and by the relative yields of crystalline tetrabromoquinone. The comparative ease with which combined bromine is removed by treatment with alcoholic sodium hydroxide was also shown to be a distinguishing characteristic. The untreated lignin and humic acids contained widely different percentages of nitrogen, but some degree of similarity was shown in the proportions of the total nitrogen dissolved during the bromination treatment and in the character of the soluble nitrogen with respect to the ammoniacal form. The percentages of insoluble nitrogen, however, exhibited variations in the same relative order as did the nitrogen contents of the untreated samples.

"Evidence of the presence of aromatic constituents in the composition of lignin, and to a lesser degree in the humic acid preparations, was found in the production of tetrabromoquinone. The presence of aromatic groups is in accord

with the majority of formulas proposed for lignin. The chemical behavior of the humic acid preparations toward bromination appeared to vary according to the degree of decomposition of the material from which these fractions were separated. Comparisons with the behavior of lignin indicated, in general, that the humic acid fraction becomes less similar to lignin as decomposition advances. It is of course recognized that lignin from different sources varies in composition and that other comparisons might have shown somewhat different relationships.

"If the formation of tetrabromoquinone is at all characteristic of lignin under the conditions of the bromination treatment it may be concluded from the relative yields as well as from the other relationships already discussed that lignin comprises only a small part of the humic acid fraction derived from partly decomposed peat or soil organic matter. Lignin, if the type found in corncobs was originally present in the plant material, must, therefore, either have undergone extensive decomposition or have lost its identity in the formation of new complexes [E. S. R., 68, p. 163] which comprise the humic acid fraction."

The effect of calcium ions and reaction upon the solubility of phosphorus, E. J. Benne, A. T. Perkins, and H. H. King (*Soil Sci., 42 (1936), No. 1, pp. 29–38, figs. 3*).—The authors have investigated, at the Kansas Experiment Station, the solubilities of the phosphates formed by treating dilute solutions of various proportions of a number of calcium compounds, with variations of the pH value, and the solubilities of phosphates in a soil saturated with calcium and subjected to variations of the pH value.

"Ca^{++} ions did not precipitate phosphorus from solution until the pH approached 5.5. Maximum precipitation or minimum solubility was not reached until the pH approached 7.5. Large excesses of $CaCO_3$ failed to precipitate completely the phosphorus from solution, apparently because of its slight solubility. Slight additions of CaO reduced the phosphorus in the filtrate to a minimum at an average pH of 7.36 and held it there at the higher pH values. Large excesses of $CaCl_2$ precipitated no phosphorus from solution until the pH was raised by NaOH. Minimum solubility occurred at pH 7.36 and remained constant when the pH was extended above this value.

"The soil saturated with calcium precipitated phosphorus much like a sparingly soluble calcium salt from a weak acid. The phosphorus solubility curve with this soil is similar to that with $CaCO_3$ but, probably because of adsorption, is displaced with respect to it. When the pH of the calcium soil was varied with HCl, the added phosphorus failed, until a pH of almost 0 was reached, to remain completely in solution. A minimum appeared in the solubility curve at pH 2.56; then a gradual rise occurred to define a maximum at approximately pH 5. The minimum at pH 2.56 may be ascribed to the removal of phosphorus by Fe^{+++} ions which had entered the solution under the influence of the acid, whereas the maximum at pH 5 may be ascribed to the fact that the Fe^{+++} and Al^{+++} ions could no longer exert their maximum precipitating effect upon the phosphorus, and the maximum precipitating effect of the Ca^{++} ions had not been attained. Additions of NaOH, CaO, and $CaCO_3$, respectively, lowered the curve from the maximum at pH 5, but to different extents and by slightly different paths. CaO caused complete precipitation of phosphorus at pH 7.46 and held it there at the higher pH values. $CaCO_3$ did not raise the pH above neutrality and did not cause complete precipitation of the phosphorus. NaOH raised the pH to 8, but complete precipitation of the phosphorus did not occur, probably because of the slight solubility and low degree of ionization of the soil."

The effect of phosphates on the cation exchange capacity of certain soils, A. L. Prince and S. J. Toth (*Soil Sci., 42 (1936), No. 4, pp. 281–290*).—The authors have carried out at the New Jersey Experiment Stations base-exchange

studies on Sassafras silt loam soil which had received three different amounts of superphosphate yearly since 1922 as well as equivalent amounts of nitrogen from different sources. The barium acetate and ammonium acetate extraction methods were used in determining the exchange hydrogen, the total cation exchange capacity, and the individual cations. Also several composite soil samples were electrodialyzed to determine the ultimate pH values.

"The field pH values were very little affected by increasing the amount of phosphates. The exchangeable hydrogen was greatly increased by phosphation, and the ultimate pH values were lowered. The total cation exchange capacity was distinctly increased when the phosphorus applications were doubled or tripled. The above findings . . . may be explained on the basis that phosphates increase the acidoid : basoid ratio. As a result, the total cation exchange capacity increases. The exchangeable calcium, magnesium, potassium, and sodium showed no significant differences in relation to the amount of added phosphates.

"Further evidence that phosphation of a soil material increases the cation exchange capacity was shown by a laboratory experiment using a calcium-saturated Colts Neck loam. With this soil, phosphation increased the cation exchange capacity depending upon the amount of phosphorus adsorbed. Also a correlation between the increase in cation exchange and the reduction in free ferric oxide was noted in this study."

Availability of soil phosphates for the plant from the viewpoint of colloid chemistry, A. T. Tiulin (*Soil Sci., 42 (1936), No. 4, pp. 291–299*).—In the work here described "the gel of iron and two soils—Krasnozem and Chernozem—were used as absorbents. Both the iron gel and the soils were evenly saturated with phosphate anions to varying degrees of saturation by means of a special method.

"The direct availability of the adsorbed phosphate anions to the plant (oats) was tested in pot-culture experiments (with isolated nutrition) in relation to the degree of saturation. The phosphate anions became available to the plant at the critical zone of saturation. Below this zone the phosphate anions are unavailable to the plant, even when supplied in quantities far exceeding the needs of the plant. In explaining the availability or desorption of phosphate anions we have mainly utilized the theoretical considerations of [V. A.] Kargin, which follow from his recent, unpublished work on molecular adsorption and adsorptional distribution."

The practical significance of the "critical zone of saturation" for the quantitative determination of the fertilizer requirement of the soil is indicated.

Phosphate fertilization of California soils given special study, H. D. Chapman (*Citrus Leaves, 17 (1936), No. 2, pp. 3–5, 20, 24, fig. 1*).—This is the first of a group of papers from the California Citrus Experiment Station briefly discussing the fertilizer needs of California soils, with reference especially to citrus orchard treatments. Although somewhat more than 50 percent of the southern California arable lands are either of rather low phosphate content or are calcareous, so that the phosphate content is not readily available to annual crops, citrus orchards are believed generally to need no added phosphates but to benefit more from treatments, including added organic matter, which tend to render the natural supply of phosphate more readily available.

Methods for diagnosing phosphate deficiencies in California soils, H. D. Chapman (*Citrus Leaves, 17 (1936), No. 3, pp. 6, 7*).—The author continues the discussion above noted, reporting very briefly some preliminary experiments with the use of oats in a plant-indicator method for the detection of phosphate deficiencies. Preliminary work with citrus indicated the possibility that, "par-

ticularly with trees, complications may arise from translocation and transformation changes which will either limit or render the test unreliable."

Nitrogen and sulphur affect phosphate in California soils, H. D. CHAPMAN (*Citrus Leaves, 17 (1936), No. 4, pp. 5, 6, 21, fig. 1*).—The author concludes his treatment of the subject of the fertilizer needs of California soils, above noted, with a brief account of experiments indicating that phosphate available in calcareous soil is increased by the addition of the physiologically acid nitrogen fertilizers, that sulfur and colloidal silica also have this effect, and that the decomposition of organic matter in the soil has a solubilizing effect upon soil phosphates.

The distribution and condition of the potassium in a differentially fertilized Hagerstown clay loam soil planted to apple trees in cylinders, W. THOMAS (*Jour. Agr. Res.* [*U. S.*] *53 (1936), No. 7, pp. 533–546*).—At the Pennsylvania Experiment Station three horizons of a Hagerstown clay loam soil contained in cylinders planted to apple trees were treated with various combinations of sodium nitrate, monocalcium phosphate, and potassium sulfate. Investigation of the state and distribution of the potassium content of the soils after 6.5 yr. of such treatment showed that "approximately one-third of the residual applied potassium has moved into the subsurface (7- to 21-in.) layer. There is no definite evidence of movement of applied potassium into the 21- to 53-in. layer. Under the conditions of continuous leaching of these experiments the amounts of potash removed from the surface soils of the check and also of the treated cylinders by distilled water was more than half of that removed by M/2 ammonium acetate (the so-called exchangeable potash) . . . . The system of green manuring adopted in this experiment has resulted in increasing the so-called exchangeable potassium of the 0- to 21-in. layer almost 50 percent. Only about 50 percent of the residual applied potassium was found in a form soluble in M/2 ammonium acetate. The remainder has been converted into less soluble forms. The relative quantities of the residual applied potash removed under conditions of continuous percolation from the 0- to 21-in. layer of the NPK-treated cylinder in sod by distilled water, M/2 ammonium acetate, and 0.2 N nitric acid were 40, 50, and 80 percent, respectively."

From the present and earlier reported experiments a theoretical fertilizer ratio for apple trees in a Hagerstown clay loam soil is derived. The theoretical ratio of $N:P_2O_5:K_2O$ is 4.47 : 8.0 : 3.28.

The necessity for the reconsideration of the significance of "all water-soluble and so-called exchangeable potash data" in soil investigations is discussed.

Commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 222 (1936), pp. 73, fig. 1*).—This circular presents the results of the inspection analyses for 1935, together with statements of the tonnages of the mixtures having the largest sale in the State, and other related statistics and data. The tonnage of 2-12-6 amounted to 40 percent of all the fertilizer sold, and more than 81 percent of the total tonnage was confined to 33 analyses.

Inspection of commercial fertilizers, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 84 (1936), pp. 47*).—In addition to the analytical data for the 1936 fertilizer inspection, this bulletin contains statements of the comparative cost of fertilizer chemicals and unmixed fertilizers, fertilizer and plant food tonnages, etc. Of the total tonnage of mixed fertilizer sold in Massachusetts, 67 percent was from grades recommended by New England agronomists to meet New England conditions and 21 percent additional tonnage was from grades varying but 1 per cent in one or more plant food elements from the grades thus recommended.

AGRICULTURAL BOTANY

Nutrition studies with corn.—I, A statistical interpretation of the nutrient ion effect upon growth in artificial culture, J. R. Beckenbach, C. H. Wadleigh, and J. W. Shive (*Soil Sci., 41 (1936), No. 6, pp. 469–489, pls. 2, figs. 7*).—In this study by the New Jersey Experiment Stations, a system of physiologically balanced solutions is presented in which it is possible to vary the concentration of ions and to isolate the effect of any ion or ion combination on plant growth. The series was used on a strain of hybrid corn, growth being used for comparing the effects of the ions. A statistical analysis of the data obtained led to the following conclusions:

"No correlation was observed between the amounts of $SO_4^{=}$ or PO_4 in the substrate and the growth of the plants within the limits of the concentrations employed. Increasingly high concentrations of NO_3^- in the substrate, between the limits of 1 and 8 out of a total of 10 relative parts of the anion concentration, gave the most marked correlations with increases in growth. Increasingly high concentrations of both K^+ and Ca^{++}, between the same concentration limits, gave marked increases in growth. Increasingly high concentrations of Mg^{++}, between the same limits, resulted in decreased growth, producing symptoms of toxicity in the high concentration utilized. The net regression curve had a negative slope within the limits of the variation of the Mg^{++} supply in the substrate.

"The importance of the relative concentrations of the cations is entirely dependent upon the amount of NO_3^- present in the substrate. At low concentrations of NO_3^- little importance can be attached to the relative proportions of the three cations. At higher concentrations of NO_3^-, the necessity for higher relative proportions of K^+ and Ca^{++} and for lower relative proportions of Mg^{++} in the substrate for maximum response to the NO_3^- is brought out. With high concentrations of both Mg^{++} and NO_3^-, the toxicity of the Mg^{++} is particularly noticeable in the manner in which it inhibits the growth of the plants. None of the three cation ratios, Ca/Mg, K/Mg, or K/Ca, show any significance in these experiments. The dry weight data showed correlations between the percentage of dry weight and relative concentrations of three of the major nutritional elements. The higher the available relative amounts of both NO_3^- and K^+, the lower the percentage of dry weight of the tissues produced. With increasing Ca^{++} concentration in the medium, there was a higher percentage of dry material in the tissues."

The biochemistry of the nitrogenous constituents of the green plants, G. T. Nightingale (In *Annual Review of Biochemistry, V*, edited by J. M. Luck. *Stanford University, Calif.: Stanford Univ. Press, 1936, vol. 5, pp. 513–524*).—The constituents discussed in this review are glutamine; ammonium, nitrate, and nitrite assimilation, and influencing factors; translocation and seasonal changes; seeds and storage organs; and methods. A bibliography of 64 titles is included.

Metabolism of carbohydrates and organic acids in plants (exclusive of bacteria and fungi), W. Ruhland and J. Wolf (In *Annual Review of Biochemistry, V*, edited by J. M. Luck. *Stanford University, Calif.: Stanford Univ. Press, 1936, vol. 5, pp. 485–512*).—This review discusses the methods for determination of carbohydrates in plants, the occurrence and chemical relations of particular carbohydrates, and the physiological behavior of carbohydrates, glucosides, and organic acids.

A literature list of 212 titles is appended.

Recent investigations on the causes of the injurious effect of strongly acid soils on plant growth [trans. title], K. Schaerer (*Forschungsdienst, 1 (1936), No. 7, pp. 505–512*).—This is a review, with 61 literature references.

Relation of temperature and time to carbon dioxide production and growth in continuously aerated malt-agar cultures of Polystictus versicolor, T. C. Scheffer (*Plant Physiol., 11 (1936), No. 3, pp. 535–564, figs. 7*).—In this physiological study of the wood-destroying fungus *P. versicolor*, grown for 5 days on malt agar in darkness, five temperatures were maintained, viz, 17.5°, 21.5°, 25.5°, 29.5°, and 33.5° C., and average daily growth rates and CO_2 production are presented (also rates of CO_2 production per unit of mycelium). A full account is given—with diagrams and photographs—of the results and of the special methods and devices used, including a new tube for cultures with continuous gas flow, arrangements for controlling the gas flow, temperature control, an apparatus for collecting and measuring the CO_2 produced, preparation of the agar strips for substrate, and preliminary treatment of the cultures.

General nature of the process of salt accumulation by roots, with description of experimental methods, D. R. Hoagland and T. C. Broyer (*Plant Physiol., 11 (1936), No. 3, pp. 471–507, figs. 9*).—In this contribution from the University of California, "a technic is described for the study of salt accumulation by excised barley roots, which are especially adapted to the investigation of certain general problems of salt accumulation. It is shown that under proper conditions, which are defined, potassium salts accumulate very rapidly in the sap of excised roots, against concentration gradients. A number of variables must be carefully controlled or evaluated in experiments on salt accumulation by excised roots, particularly (1) age of roots and proportion of actively metabolizing cells, (2) initial salt content of roots, dependent on supply of nutrient salts provided during preliminary growth period, (3) seasonal effects on development of root system, (4) available carbohydrate, [and] (5) variability of material.

"Accumulation of salt is associated with active aerobic respiration of the roots. An adequate supply of oxygen is indispensable for both cation and anion accumulation. Data pertaining to effects of varying oxygen tensions on salt accumulation are discussed. Temperature coefficients of salt accumulation were found to be of a high order, but evidence of this can be obtained only under experimental conditions carefully chosen to eliminate certain complicating factors.

"The experiments on excised roots lead to fundamental conclusions similar to those derived from experiments on salt accumulation by storage tissues, and additional aspects of the problem of salt accumulation are presented for study. Attention is directed to the importance of the results on salt accumulation by root cells relative to other problems such as root pressure, translocation of salts, and the general metabolism of root cells."

Salient features of the root system relative to the problem of salt absorption, P. Prevot and F. C. Steward (*Plant Physiol., 11 (1936), No. 3, pp. 509–534, figs. 4*).—In barley roots in water culture the potential absorbing surface was found to extend from the apex to the point of origin of the secondary roots. The functional absorbing zone is limited by factors operating on the cortical cells. The endodermis histology and the incidence of vascular differentiation may serve to define the region of most rapid removal, but they are not directly concerned with absorption and accumulation of salts by roots. The root segments near the apex attained a higher concentration than those more remote. This was established for barley plants with both "high-salt" and "low-salt" types of nutrition, secondary roots of broadbean (*Vicia faba*), and roots of cotton, all of which were grown in water culture. The metabolic and devel-

opmental factors involved in this longitudinal gradation of salt accumulation are discussed, and it is concluded that it is an inevitable consequence of the progressive development of cells from the root apex. The interrelations between effects of time, nutrition, and salt accumulation are described, and the features common to these and other representative types of absorption/time curves are emphasized. All the time effects are interpreted in terms of the previous nutrition and the capacity for further growth of the system concerned. Special attention is given to the probable role of the root cortex and to certain problems which it presents.

Effect of transpiration upon the absorption and distribution of mineral salts in plants, R. O. Freeland (*Amer. Jour. Bot., 23 (1936), No. 5, pp. 355–362, figs. 4*).—In this study by the Ohio State University, all plants under high transpiration conditions had more ash, calcium, phosphorus, potassium, and dry weight than similar plants under low transpiration. In general, potassium and calcium increased most. The distribution of mineral elements in plants under high and low humidities differed. In general, under high transpiration the mineral content was increased more in leaves and roots than in stems, and calcium and potassium were usually most affected. There appeared to be no direct correlation between the mineral content and the dry weight of the leaves, stems, and roots.

"The data indicate that increased absorption and movement of water in plants may appreciably increase absorption and translocation of certain mineral ions."

Respiration and metabolism in etiolated wheat seedlings as influenced by phosphorus nutrition, W. W. Jones (*Plant Physiol., 11 (1936), No. 3, pp. 565–582, figs. 10*).—Marquis spring wheat, grown to maturity in the greenhouse in a phosphorus-deficient nutrient solution, yielded fewer and lighter seeds with higher protein and lower starch and phosphorus contents than similar plants with a complete nutrient solution. The addition of phosphorus to the solution in which seeds were germinated caused an increase in CO_2 production of about 10 percent, in most cases, regardless of whether the seeds had come from plants on the phosphorus-deficient or the complete nutrient solution.

Using two species of wheat (*Triticum vulgare* and *T. durum*), including three varieties, grown in nutrient solutions for 7 days, with respiration measurements, the following conclusions were drawn: Plants on a complete nutrient solution respired about 6 percent more CO_2 and contained more insoluble and less soluble nitrogen, less reducing sugars, and more insoluble and soluble phosphorus than plants grown in a nutrient solution lacking phosphorus. No starch was found in the tops or roots of the wheat seedlings in any case, nor was sucrose found. In this study respiration was not limited by the lack of available carbohydrates, but rather by the lack of phosphorus. Phosphorus seems to influence respiration in two ways, viz, directly by association with carbohydrates to form a suitable substrate for the respiratory enzymes, and indirectly as it limits protein synthesis.

Transpiration as modified by potassium, A. G. Snow, Jr. (*Plant Physiol., 11 (1936), No. 3, pp. 583–594, figs. 4*).—Grown in nutrient solutions lacking potassium, the transpiration rate of sunflower, tobacco, or bean plants decreased after a time. Sunflower appeared inherently to use more water than tobacco, but the latter responded more quickly in its transpiration rate, owing to lack of potassium, than did sunflower. The influence on the transpiration rate in plants grown in a solution lacking potassium was quicker than in plants grown in a solution in which sodium replaced the potassium. The greatest decreases in transpiration rates of plants starved of potassium occurred during the periods

of highest light intensity and temperature, i. e., when environmental conditions normally increased transpiration.

Possible explanations for the observed experimental results are discussed.

The rôle of special elements (boron, copper, zinc, manganese, etc.) in plant nutrition, P. MAZÉ (In *Annual Review of Biochemistry, V,* edited by J. M. LUCK. *Stanford University, Calif.: Stanford Univ. Press, 1936, vol. 5, pp. 525–538*).—In this review the author discusses the absorbing functions of roots, the migration of mineral elements within the plant, the influence of special elements on plant development, indifferent and toxic elements, and plant diseases and resistance to cryptogamic infection in relation to mineral nutrition. The bibliography contains 38 titles.

The action of minor elements on plant growth [trans. title], K. SCHARRER (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 44 (1936), No. 4–6, pp. 223–247*).—This is a general review, with 103 bibliographic references.

The quantitative distribution of boron in Vicia faba and Gossypium herbaceum, R. C. MCLEAN and W. L. HUGHES (*Ann. Appl. Biol., 23 (1936), No. 2, pp. 231–244*).—The boron content in the tissues of *V. faba* and *G. herbaceum,* grown in solutions of known concentration, was ascertained and the distribution found to be regular and definite. The highest percentage was in the leaves, increasing regularly with age. In the petioles and stem apex the amount was about equal, and approximately double that in the stem. The lowest concentration was in the roots. It is believed that this distribution is not due entirely to passive transportation in the transpiration current. Boron is also present in seed grown on ordinary soil but is confined to the cotyledons, the percentage content in *Vicia* being 50 percent above that of the stems. The amounts of boron are extremely small, and they are not directly dependent on the concentration supplied. Its importance is believed to lie in an activating or regulatory role in metabolic processes.

The effect of lead on plant growth [trans. title], K. SCHARRER and W. SCHROPP (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 43 (1936), No. 1–2, pp. 34–43, fig. 1*).—In sand cultures of wheat, rye, barley, oats, and maize to which were added from 10^{-10} to 100 mg of lead as acetate, the maize was least injured by the lead ions and rye proved very resistant. Barley, oats, and especially wheat were very susceptible, the latter being strongly depressed both in growth and yield. In liquid cultures of Richter's nutrient solution to which similar additions were made, maize was not only not injured by the highest amounts but in some cases was even favorably influenced.

The effect of thallium on plant growth, E. E. HORN, J. C. WARD, J. C. MUNCH, and F. E. GARLOUGH (*U. S. Dept. Agr. Circ. 409 (1936), pp. 8*).—"Under laboratory and field conditions on various types of soil, the addition of thallium compounds up to 10 p. p. m. (10 lb. of thallous sulfate per acre, equivalent to 1,000 lb. of thalgrain per acre) had no injurious effects on vegetation, and in many instances appeared to stimulate plant growth. With the application of larger quantities, injury was observed. Under field conditions no damage occurred during 9 mo. of dry weather, but it developed following the rainy season. Thallium compounds, when applied to the soil in varying concentration up to 1,280 lb. per acre, failed to kill or apparently even to injure *Ribes* in 8 weeks. In control work ground squirrels consumed thalgrain so rapidly that no damage to plant growth was found on areas treated as frequently as nine times.

"Under the conditions used in the control of rodents by properly trained personnel, no evidence of injury to vegetative growth by thalgrain has been found."

The action of crude benzene on plant growth [trans. title], W. Speyer (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 9, pp. 411–417, figs. 7*).—Experiments are reported relative to the injurious effects on plants of benzene used in insect and weed control. The plants used were rye, potatoes, flax, carrots, sour cherries, and shrubs.

Vitamins and plant growth [trans. title], S. Rehm (*Forschungsdienst, 1 (1936), No. 7, pp. 513–516*).—This is a review of recent investigations on the relations of vitamins and other growth-promoting substances to the growth of both higher plants and micro-organisms, but with special reference to fungi and to mycorrhizal phenomena. There are 23 literature references.

The diffusion porometer, F. G. Gregory and J. I. Armstrong (*Roy. Soc. [London], Proc., Ser. B, 121 (1936), No. 820, pp. 27–42, figs. 8*).—"The paper discusses a method for determining experimentally the relative diffusion capacity of stomata at different apertures. The method depends upon the difference in rate of diffusion through the stomata of hydrogen and air. An instrument is described embodying this principle."

Critical remarks on some of the most important methods for determining the degree of aperture of the stomata [trans. title], K. Hartsuijker (*Rec. Trav. Bot. Néerland., 32 (1935), No. 2, pp. 516–542, figs. 4*).—The author compares the results of the collodion film method, the alcohol fixation method, the vertical illuminator, the ordinary porometer, and the horizontal porometer for determining the apertures of leaf stomata. The first two proved unsatisfactory. The vertical illuminator proved useful if exposure to the light was brief. The porometers gave consistently satisfactory results, particularly the horizontal porometer. Twenty-one references are cited.

A field method for the determination of the momentary amount of assimilation of land plants [trans. title], W. Holdheide, B. Huber, and O. Stocker (*Ber. Deut. Bot. Gesell., 54 (1936), No. 2, pp. 168–188, pls. 3*).—The apparatus consists of absorption vessels which, with the normal CO_2 content of the air and the higher transpiration rate, insure a 100 percent absorption and simultaneously permit a very exact quantitative serial analysis to be made by means of conductivity measurements. The whole is easily transportable, and the determinations may be made on plants in situ.

Comparative effects of altering leaf temperatures and air humidities on vapor pressure gradients, O. F. Curtis (*Plant Physiol., 11 (1936), No. 3, pp. 595–603, figs. 2*).—In this contribution from Cornell University data are presented indicating that a rise of 5° C. in leaf temperature above that of the air may increase the vapor pressure gradients by amounts equivalent to those due to lowering the external relative humidity by from 30 to nearly 38 percent. A rise to 10° above the air would be equivalent to lowering the humidity by from 67 to 90 percent or to increasing the vapor pressure gradient by from 8 to 30 mm. of mercury. Curves show the effects in terms of the equivalent lowering of the relative humidity on the vapor pressure gradient resulting from raising the leaf temperature, and other curves give the effects of rises in leaf temperatures on vapor pressure gradients in terms of millimeters of mercury. Assuming no change in the amount of water vapor in the air, these curves may be used to predict the maximum possible effects of an equal rise of both leaf and air temperatures on the vapor pressure gradient between leaf and air. A rise in air temperature corresponding to that of the leaf usually tends to reduce transpiration to a rate less than would occur if the air temperature remained low and the leaf temperature alone rose. The "concept that a rise in air temperature increases transpiration because the relative humidity is thereby lowered, or that the air is less saturated, or that it has a higher vapor pressure

deficit, is a false concept, for the increased transpiration is due solely to a rise in leaf temperature."

Absorption of ultraviolet light by cellophane and by plant organs and tissues [trans. title], E. GILLES (*Compt. Rend. Acad. Sci.* [*Paris*], *202* (*1936*), *No. 11, pp. 968–970*).—Using both spectroscopic and photoelectric methods and the mercury vapor lamp as light source, cellophane proved, in general, to be notably transparent to ultraviolet rays, and it may be used to replace quartz in certain physiological tests. Plant cells also may be much more permeable to these rays than generally supposed. The lower epidermis transmitted all the spectrum of the mercury vapor lamp. Leaves of *Begonia*, *Tradescantia*, *Oxalis*, *Plantago*, and *Salvinia* and the extremities of leaflets of *Cystopteris* were almost completely opaque, but the leaves of *Elodea* taken near the bud were relatively transparent. The integuments of seeds of lentils and peas were almost as opaque as the leaves.

Daily variations in products of photosynthesis, water content, and acidity of leaves toward end of vegetative period, P. P. STANESCU (*Amer. Jour. Bot., 23* (*1936*), *No. 5, pp. 374–379, figs. 2*).—It was found by this study at Cornell University that the important daily variations in carbohydrates common in green leaves occur also during the last days of the vegetative period and with the same rhythmic character as during summer. The curves of the hexoses frequently showed an opposite course to those of sucrose or starch, this being particularly marked during the daytime. Toward the end of the vegetative period the beginning of starch accumulation was generally observed later in the morning than during summer. The monosaccharides predominated in the petioles, starch was second in amount, and sucrose occurred in very small quantities or was often lacking. The water content of laminae also presented rhythmic oscillations. The absolute content in the petioles was always higher than in the laminae. Water absorption by the tissues was associated with a synthesis of organic materials. A relation between the marked variations of carbohydrate and of water contents and the weak oscillations of the actual acidity was not observed. Usually there seemed to be a contrast between the curves of the acidity in the lamina and in the petiole. Toward the end of fall the temperature apparently represents a limited factor.

Long- and short-day plants: A review of investigations of photoperiodism [trans. title], G. BORGSTRÖM (*Nord. Jordbrugsforsk., 1935, No. 8, pp. 119–140*).—This review of the literature covers the period from 1920 to 1935, and a four-page bibliography is provided.

The structure of the cell wall in plants [trans. title], A. FREY-WYSSLING (*Protoplasma, 25* (*1936*), *No. 2, pp. 261–300, figs. 18*).—This study discusses the amicroscopic, submicroscopic, and microscopic structure of the cell membrane.

Vegetative anatomy of the tomato (Lycopersicum esculentum Mill.).—I, Stem structure, E. F. WOODCOCK (*Mich. Acad. Sci., Arts, and Letters, Papers, 21* (*1936*), *pp. 215–222, pls. 2, figs. 2*).—In this contribution by Michigan State College, the anatomy of the tomato stem is described and illustrated in detail, including the epidermis, endodermis, and vascular tissues (with the leaf traces). In structure, the tomato stem proved to be markedly similar to that of the potato as described by Artschwager (E. S. R., 39, p. 629).

Researches on the legume-nodule bacteria [trans. title], S. WINOGRADSKY (*Ann. Inst. Pasteur, 56* (*1936*), *No. 3, pp. 221–250, figs. 2*).—From the data here presented, together with comparisons of the results with the literature of the subject, the author concludes in favor of the atmospheric origin of the nitrogen liberated by the nodules of legumes in the form of ammonia.

The effect of the colour and nature of light transmitted by wrapping materials on bacterial and mould growth, D. H. F. CLAYSON (*Jour. Roy. Sanit.*

Inst., *57 (1936)*, *No. 5*, *pp. 272–278*).—This is a general review (with a bibliography of 26 titles) and a record of the results of preliminary experimental work by the author on wrapping materials for foods. No appreciable effect of white or colored light, free from ultraviolet light, on the growth of *Penicillium glaucum*, *Pseudomonas fluorescens*, or *B[acillus] coli* could be detected.

On the significance of mycorrhiza, A. BURGES (*New Phytol.*, *35 (1936)*, *No. 2*, *pp. 117–131*).—The author concludes that the fungus in a mycorhizal association is a case of controlled parasitism. It is without mutualistic significance, and the soil organisms responsible for decomposition bear no necessary connection with the mycorhizal fungi (though conceivably a fungus may act in both ways).

Zygosaccharomyces pini, a new species of yeast associated with bark beetles in pines, E. C. HOLST (*Jour. Agr. Res.* [*U. S.*], *53 (1936)*, *No. 7*, *pp. 513–518*, *pl. 1*, *fig. 1*).—A yeast has been found generally associated with certain bark beetles, *Dendroctonus* and *Ips* species, in the United States. A determinative study placed it in the genus *Zygosaccharomyces*, since ascospore formation is preceded by a heterogamic sexual process. The formation of four hat-shaped ascospores per ascus, together with the fact that of the common sugars only glucose, fructose, and mannose are fermented, identifies it as a new species for which the name *Z. pini* is proposed. The organism is illustrated and fully described.

GENETICS

A genetic factor for the annual habit in beets and linkage relationship, F. A. ABEGG (*Jour. Agr. Res.* [*U. S.*], *53 (1936)*, *No. 7*, *pp. 493–511*, *figs. 6.*)—The inheritance of the annual or bolting character in beets (*Beta vulgaris*) was determined in crosses of three relatively biennial types with an annual strain selected by Munerati. Annual (beets developing seedstalks during the first season) v. biennial habit (*Bb*) was found to be controlled by a simple Mendelian factor pair, with the annual habit dominant, confirming Munerati's results (E. S. R., 66, p. 816). The numbers of annual and biennial beets observed in backcross and F_2 progenies were in close agreement with the expected 1:1 and 3:1 ratios, respectively. Annuals in both F_1 and F_2 progenies were slower in their average rate of seedstalk development than the annual parental strain. *BB* and *Bb* plants evidently do not differ greatly in rate of seedstalk growth. There may be modifying factors which retard the time of blooming while not suppressing the initiation of the reproductive phase. *B* assorts independently with *Pl*, the factor connected with the plantain leaf venation character. Definite linkage of *B* was noted with *R*, the common hypocotyl crown color factor. The cross-over value from all data approximated 15.5 percent, which placed *B* in the *R–Y* linkage group determined by Keller (E. S. R., 75, p. 188). The biennial strains used in the study seemed to correspond in their bolting character with similar types commonly present in cultivated sugar beet varieties.

Inheritance of certain colour characters in gram (Cicer arietinum), V. RAMANATHA AYYAR and R. BALASUBRAMANIAM (*Indian Acad. Sci. Proc.*, *4 (1936)*, *No. 1*, *Sect. B*, *pp. 1–26*, *pl. 1*).—The modes of inheritance in 3 types of flower colors and 13 types of seedcoat colors in gram (*C. arietinum*) were studied in crosses between pure lines isolated at Pusa and Coimbatore.

The production of pink, blue, and white petals is controlled by three factors *C*, *B*, and *P*, of which *C* and *B* are complementary and *P* supplementary to *B*. When all the three factors are in combination, the flowers are pink.

If B and C alone are present, blue flowers are produced, while in all other combinations, the petals are white.

As to seed colors, C has no effect, and Bb, Pp, T^1t^1, T^2t^2, and F^rf^r alone account for the existence of various shades among the 13 grades. None of them were found to be linked, and all showed dominance. P and T^1 showed supplementary type of interaction in development, while F^r was hypostatic to B. B and F^r exhibited pleiotropic effects on plant characters. B imparts, by itself, dark olive buff color to the seedcoat. P is inactive alone but causes considerable changes in the phenotypes in the presence of B. T^1 and T^2 affect only the seedcoat colors. T^1 is inoperative except with P, when it darkens the color pattern. T^2 also has the same reaction but its expression is influenced by the genic background. F^r has no chromatic effect in the presence of B, dilutes the pigmentation when not with B, and makes the seedcoat darker if B and P are both present.

The shape of the seeds is also affected by certain factors. F^r converts irregular shaped seed into round, but this property is masked by B when with the recessive p. B also produces round seeds but not in the BP condition. With B alone without P, the seeds are reduced considerably in size, but are restored to normal weight when P is added to B. The surface of the seeds is puckered by action of F^r, this effect being much reduced when in association with B and P, or B and T^2.

The reaction of wheat hybrids to a spring frost, J. B. Harrington (*Canad. Jour. Res., 14 (1936), No. 5, Sect. C, pp. 185–189*).—A moderate June frost (E. S. R., 75, p. 617) proved highly efficient in separating wheat hybrid lines for resistance to spring frost. Eighty of 332 F_4 lines of H–44–24 × Reliance and fully 56 of 227 F_4 lines of (Reliance × Reward) × Reliance appeared to have the superior frost resistance of Reliance. Significant genetic differences in frost reaction were found among the lines of each of two new varieties.

[Genetic investigations with sheep and goats] (*Texas Sta. Rpt. 1935, pp. 35–37, 197*).—Results are reported by B. L. Warwick as to the inheritance of the ridgling characteristic in goats; by Warwick, J. M. Jones, W. H. Dameron, and P. B. Dunkle on the inheritance of the polled character in fine wool sheep; and by Warwick, R. O. Berry, A. Hogan, and W. R. Horlacher on cytological studies of the chromosome numbers in sheep and goats and the diagnosis of pregnancy.

Studies of a size cross in mice, [I], II, W. E. Castle, W. H. Gates, S. C. Reed, and L. W. Law (*Genetics, 21 (1936), No. 1, pp. 66–78; 4, pp. 310–323*).—In further studies of size inheritance in mice (E. S. R., 75, p. 762), crosses were made between a race of *Mus musculus* having pink eyes, short ears, and a dilute nonagouti coat, and black and white Japanese waltzing mice derived from the *M. bactrianus* race. Adult males of the parent races averaged 26.2 and 17.6 g, respectively, as compared with an average of 25.4 g for 5 adult F_1 males. F_1 animals were reciprocally backcrossed with dilute browns. When the 1,236 progeny were grouped by the 4 color classes, the blacks were smallest, 28.24±0.16 g and 21.46±0.12 g for males and females, respectively; blues, 28.64±0.17 and 22.32±0.13; browns 29.09±0.18 and 22.61±0.13; and dilute browns 30.01±0.17 and 22.61±0.14 g for males and females, respectively. In body length, the animals rated in the same order. Brown animals were significantly larger than blacks, and dilutes were larger than intense animals. It is concluded that the differences in the sizes of the different colored groups are due to the physiological action of the genes for those characters rather than to linkages with specific size genes. Males were significantly larger than females.

In a further study on the weight, body length, and tail length of the backcross individuals reported in the foregoing paper and produced by using a strain of *Mus bactrianus* in the cross, similar results were obtained in that dilute individuals were larger than intense mice as judged by all three characteristics, and brown was found to be more influential than dilution in increasing weight and body length, but dilution was a more important factor than brown in increasing tail length. Linkage of the color genes with size genes is not considered an adequate explanation of the differences observed. Therefore, the direct physiological effect of the color genes on general growth is suggested except that dilution has a special local action on tail length.

Size inheritance in mice, W. E. Castle (*Amer. Nat., 70 (1936), No. 728, pp. 209–217*).—A further discussion of the relation of size to color in the cross of *Mus bactrianus* and the house mouse.

Harelip in the house mouse, I, II, S. C. Reed (*Genetics, 21 (1936), No. 4, pp. 339–360, fig. 1; 361–374*).—Differences in the expression of the harelip character in inbred mice (E. S. R., 68, p. 179) were found to be dependent upon the sex of the individual, size of litter, age of mother, asymmetry of the clefts, and to a considerable extent upon chance factors. Non-harelip animals appeared in a population of 1,284 mice inbred from 10 to 14 generations which should be essentially homozygous for the genetic factors responsible. There was also much variation in the expression of the character. An attempt was made to determine the importance of different conditions, and it was concluded that 17 percent of the variation was hereditary and 83 percent due to environmental factors.

In studying the genetic bases of the inheritance of harelip in mice, progeny from an inbred strain were crossed with inbred non-harelip stock. The F_1s were backcrossed to the non-harelip stock. Tests were made to determine which of the animals so produced carried the harelip gene or genes by backcrossing them with the harelip inbred strain. In these matings, one-half of the animals were found to produce some harelip progeny and consequently carry genes for harelip. It is pointed out that this result would be simulated if one or several pairs of genes were responsible for the characteristic. In the 548 F_2 progeny, there were 6.4 percent harelip young, suggesting that a small number of genes are responsible for the condition. It could not be determined whether the character was due to one principal gene and several modifiers or to the action of a number of cumulative genes. The phenotypic expression of harelip in genotypically harelip animals was exceedingly variable, due to the interaction of genes and environmental circumstances.

Inheritance of rate of growth in Barred Plymouth Rocks, E. E. Schnetzler (*Poultry Sci., 15 (1936), No. 5, pp. 369–376*).—In this investigation at the Indiana Experiment Station 35 of the heaviest and 33 of the lightest individuals at from 8 to 9 weeks of age were selected from a large brood of Barred Plymouth Rock pullets and were designated as the fast and slow groups, respectively. These two groups were handled under similar conditions through the growing and first laying period.

The results indicate that it is possible to select fowls at from 8 to 9 weeks of age which have inherent differences in body weight. The rate of growth appears to be associated to some extent with mature body weight, maturity being attained at about the same age in both groups. The rate of egg production during the first year seems independent of body weight, but the fast-growing group laid larger eggs on the average. By selecting eggs for hatching from the fast- and slow-growing parent stock over two seasons, chicks were hatched which showed significant differences in growth rate, giving evidence that rate of growth is inherited.

The inheritance of certain characters affecting egg quality, A. Van Wagenen and G. O. Hall (*Poultry Sci., 15 (1936), No. 5, pp. 405–410*).—In this study at the [New York] Cornell Experiment Station, all eggs laid by the experimental White Leghorn flock during a 10-day period in each of the months of January and February were subjected to quality tests. The measures of quality included condition of the firm albumin, percentage of firm albumin, percentage of inner thin albumin, percentage of outer thin albumin, yolk index, and yolk color.

A tabulation of the records of individual hens showed that they differ significantly in one or more of these characters and that the value for each may be considered as clearly characteristic of that individual. In further analyses of the data for evidence of the inheritance of certain quality factors it is shown that the condition of the firm albumin exhibits inheritance typical of quantitative characters. The correlations between daughters and their dams, daughters and their sires' dams, and daughters and the average of their dams and sires' dams were 0.402±0.058, 0.502±0.057, and 0.549±0.053, respectively. These significant correlations indicate that this is an inherited character, probably dependent upon multiple factors. Similar grouping tests and correlation studies indicate that the characters, percentage of outer thin albumin, percentage of firm albumin, and yolk index have not been effectively fixed in the offspring by the type of selection which has been followed.

Results from breeding rabbits that are suckling young, C. E. Kellogg (*U. S. Dept. Agr. Circ. 410 (1936), pp. 8*).—Three groups of 40 does each were selected for comparing the effects of breeding at 28, 42, and 56 days after the previous litters were born. The results showed that 71, 58, and 75 percent, respectively, of the does accepted the buck on the breeding date. Of these services, 72, 78, and 78 percent, respectively, resulted in pregnancies. The interrelations between frequency of breeding, size of previous litters, size of subsequent litters, and weight and mortality of the young at weaning were difficult to interpret, but it is considered inadvisable to breed does on the twenty-eighth day after parturition.

Ovum age and the course of gestation in the guinea pig, W. C. Young and R. J. Blandau (*Science, 84 (1936), No. 2177, pp. 270, 271, fig. 1*).—To study the effects of time of fertilization on percentages of pregnancies, litter size, and abnormal pregnancies, 235 guinea pigs were artificially inseminated with fresh spermatozoa during heat and 18, 24, 30, 36, and 42 hr. after the beginning of oestrus. Ovulation in the guinea pig occurs about 10 hr. after the beginning of oestrus. Insemination during oestrus resulted in 80 percent pregnancies and litters of 2.7 young. The percentage of pregnancies and litter size steadily decreased and the proportion of abnormal pregnancies increased as the time of insemination was delayed. Fertilization of the older ova showed a marked tendency to termination of pregnancies near the eighteenth day of gestation.

Effect of hypophysectomy and replacement therapy on lactation in guinea pigs, E. T. Gomez and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 404–406*).—In studying the effect of pituitary hormones on lactation at the Missouri Experiment Station, hypophysectomy of guinea pigs during the first week of lactation resulted in a rapid decline, with cessation of milk secretion in two or three days. Secretion could not be maintained or restored by the administration of galactin. Lactation was maintained in two animals by injecting suspensions of whole fresh pituitaries, suggesting a probable important relation in controlling milk secretion between the pituitary and other endocrines.

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Seasonal variation in the birth rate of the milking goat in the United States, C. W. TURNER (*Jour. Dairy Sci., 19 (1936), No. 9, pp. 619–622*).—A study of the season of birth of 37,047 kids in the American Milk Goat Record Association showed that over 50 percent of the kids were born in February, March, April, and May. The anoestrus period covers April, May, June, and July and some come in heat in August in favorable years.

Pygopagus parasitic bovine twins involving the udder, C. W. TURNER (*Jour. Dairy Sci., 19 (1936), No. 10, pp. 651–653, figs. 2*).—This contribution from the Missouri Experiment Station presents a description and photographs of a parasitic bovine twin attached to the loin of the host, which was an otherwise normal Guernsey heifer. The parasite consists externally of a leg, tail, hip bones, and a complete udder with four teats. The possible significance of this case in relation to other reported cases of supernumeraries in abnormal positions in man and domestic animals is discussed.

Effects of synthetic androsterone on accessory reproductive organs of the male ground squirrel, L. J. WELLS (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 525–528*).—Data are presented on the influence of androsterone treatment in 16 male ground squirrels on the weights of the seminal vesicles, prostate gland, Cowper's gland, and bulbar gland. The weights of the glands ranged in values equaling those in the controls to double the normal weights. Synthetic androsterone failed to provoke a marked response in the accessories but stimulated precocious formation of spermatozoa and the histological development of the accessories.

Vaginal cornification induced by swabbing and its bearing on the rat unit of estrogenic substance, C. K. HU and C. N. FRAZIER (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 3, pp. 326–328*).—In studying the effect of swabbing on the production of cornified cells in the vagina of the rat, it was found that swabbing alone three or four times daily caused significant cornification in a large percentage of ovariectomized animals. Although the changes come later than those induced by oestrogenic substances, the reaction materially affects the results in biological assays.

Influence of estrone upon galactin content of male rat pituitaries, R. P. REECE and C. W. TURNER (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 402, 403*).—The results of tests at the Missouri Experiment Station indicate that the pituitary of the normal male rat contains an appreciable quantity of galactin. The amount was increased by 15 daily injections of oestrone. Determinations were made by injecting the suspensions of macerated pituitaries of treated and untreated animals over one of the crop glands of pigeons and ascertaining the degree of proliferation.

Experimental "constant oestrus" and the notion of anti-gonadotropic hormones, G. P. DU SHANE, W. T. LEVINE, C. A. PFEIFFER, and E. WITSCHI (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 3, pp. 339–345, fig. 1*).—An account is given of the bringing about of constant oestrus in one of a pair of parabiotic rats through the castration of the other twin. This was possible even in case the uncastrated animal was hypophysectomized. Oestrin evidently disappears so rapidly from the circulation that it does not reach a sufficient concentration in the castrated animal to check hypophyseal activity even though about 150 cc of blood per day is exchanged between the twins. A low grade of constant oestrum was also established by implanting testes in newborn females. The state of equilibrium established in such cases between the hypophysis and ovaries resembles the situation in the rabbit, in which neither ovulation nor luteinization occur, although one ovulation was induced by the administration of a luteinizing hormone from sheep pituitary. It is concluded that no specific anti-hormones are formed, although the hypophysis, probably through the

thyroid and adrenals, checks excessive growth of overstimulated ovaries. The loss of reactivity in ovaries after prolonged stimulation is considered an immunity reaction to foreign proteins.

Inhibitory effects by the hypophysis of rats following injections of pregnant mare serum hormone, C. HAMBURGER (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 519–522, fig. 1*).—The blood sera of normal adult female rats were found to contain no detectable gonad-stimulating hormones, and serum from castrated rats contained only small amounts. The amount of gonad-stimulating serum from such rats treated with a purified preparation of the gonad-stimulating hormone contained more of the hormone. To interpret the results, both spayed and hypophysectomized animals were employed. The results indicated that the hypophysis under the influence of oestrin inhibits the action of gonadotropic hormones.

On the biological properties of mare gonadotropic hormone, H. H. COLE (*Amer. Jour. Anat., 59 (1936), No. 2, pp. 299–331, figs. 15*).—With further reference to the gonadotropic hormone isolated from the blood serum of pregnant mares (E. S. R., 75, p. 327), it is shown that the injection of 2 rat units of the hormone into 25-day-old rats induced ovulation in most cases. Ovulation occurred at about 72 hr. after injection, and the normality of the response is indicated by the fact that the immature rats will breed, carry young to term, and in some cases raise the young to weaning time. The injection of 16 rat units induced superovulation in the 25-day-old rats, while massive doses of 500 rat units rarely caused ovulation, probably due to the fact that this high concentration caused such a rapid thickening of the follicle wall that ovulation was prevented. Similar injections did not produce mature follicles in 10-day-old rats, although at higher levels there was evidence of extensive interstitial cell growth. Male rats also showed a response to injection of this hormone, single treatments causing an increase in both tubules and interstitial cells, while prolonged treatment resulted in a marked development of the accessory organs without further affecting the tubules.

Effect of large doses of progesterone in the female rat, H. SELYE, J. S. L. BROWNE, and J. B. COLLIP (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 472–474*).—Supplementing the studies of the effect of oestrin on the female rat (E. S. R., 75, p. 614), it was found that the daily administration of 4 mg of synthetic progesterone to normally cyclic female rats caused immediate cessation of oestrus cycles, ovarian atrophy, hypertrophy of the pituitary, and slight atrophy of the thymus. The effect of ovarian hormones on the mammary gland seems largely dependent on the presence of pituitary secretions.

Procedure for quantitative extraction of sex hormones from urine, T. F. GALLAGHER, F. C. KOCH, and R. I. DORFMAN (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 3, pp. 440–444, fig. 1*).—A method is described for extracting male and female sex hormones from urine, involving acid hydrolysis, extraction with benzene, and separation into male and female fractions by alkali. An absorption process for the male hormone is also described.

A method of purification of gonad stimulating principle from pregnant mare serum, A. E. MEYER (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 3, pp. 433–436*).—A method for extraction, purification, and concentration of the gonad-stimulating principle of pregnant mare serum is described.

Experiments on urine pregnancy tests in cows, A. B. CORONEL (*Philippine Jour. Anim. Indus., 3 (1936), No. 4, pp. 273–280*).—The results of this investigation indicate that the immature female mouse is the best laboratory test animal to use in conducting the biological urine pregnancy test in cows. Employing the technic described, positive reactions were secured in 71.4 percent

of the animals examined at 2 months' pregnancy while results obtained at an earlier stage were too variable to be of value, thus demonstrating the limitations of this test.

FIELD CROPS

Statistical methods and their application to agronomy: A bibliography, compiled by K. K. Guha Roy and P. C. Mahalanobis (*Imp. Council Agr. Res.* [*India*], *Misc. Bul. 9* (*1936*), *pp.* [5]+*120*).—This bibliography lists 97 books and 1,597 references classified as mathematical—averages and variance, correlation and regression, frequency curves, and goodness of fit; and applied—field trials, meteorological, genetics, and biological.

The point-observation-plot (square-foot density) method of vegetation survey, G. Stewart and S. S. Hutchings (*Jour. Amer. Soc. Agron.*, *28* (*1936*), *No. 9, pp. 714–722, fig. 1*).—The point-observation-plat method, devised by the Intermountain Forest and Range Experiment Station (Ogden, Utah), employing a circular plat of 100 sq. ft. (5.64-ft. radius), is described as timesaving, providing for randomization and replication, and permitting statistical analysis of the data. The method is indicated as suitable for depletion surveys, for forage inventories, and for permanent plats, and also for studies in range and pasture management, in erosion surveys, in agronomy, and in ecological observations.

[**Agronomic work in Colorado**] (*Colorado Sta. Rpt. 1936, pp. 9, 14, 15, 16–19, 31, 32, 42*).—The progress of breeding work with corn, oats, sorghum, and potatoes; time of irrigation tests with small grains and other crops; inoculation studies with alfalfa; range studies, including methods of irrigating grass meadows, methods of grazing, and a forage resource survey; and control of bindweed and of other perennial weeds, are reviewed as heretofore (E. S. R., 75, p. 194).

[**Agronomic investigations in Texas**], E. B. Reynolds, D. T. Killough, G. T. McNess, R. E. Dickson, B. C. Langley, P. R. Johnson, H. F. Morris, R. H. Wyche, E. K. Crouch, H. E. Rea, H. P. Smith, D. L. Jones, V. L. Cory, W. H. Dameron, R. G. Reeves, J. O. Beasley, R. E. Karper, P. C. Mangelsdorf, M. A. Grimes, R. Treichler, G. S. Fraps, H. M. Beachell, H. Dunlavy, I. M. Atkins, P. B. Dunkle, J. R. Quinby, J. C. Stephens, R. H. Stansel, O. L. Carpenter, W. H. Friend, C. H. McDowell, and E. Mortensen (*Texas Sta. Rpt. 1935, pp. 53–57, 58–78, 79, 80, 128, 129, 142–145, 147–149, 159–164, 167–173, 182–185, 186–188, 189–196, 197–199, 202–204, 207, 208, 209–213, 218, 219, 220, 221, 222–227, 228–231, 232, 248, 249, 250, 251, 255–262, 277*).—Continued agronomic and plant breeding experiments (E. S. R., 75, p. 37) at the station and substations, reviewed briefly, included varietal tests with cotton, corn, sweet corn, wheat, oats, barley, rice, rye, grain sorghum, sorgo, sugarcane for sirup, flax, peanuts, soybeans, cowpeas, velvetbeans, alfalfa, lespedeza, clover, bur clover, sweetclover, vetch, crotalaria, potatoes, cigar wrapper tobacco, and miscellaneous winter and summer legumes and grasses; adaptation, growth, and utilization of spineless cactus (*Opuntia ellisiana*); breeding work with cotton, wheat, oats, barley, corn, sweet corn, rice, grain sorghum, sorgo, and peanuts; development of cotton varieties adapted to mechanical harvesting; inheritance studies with cotton, corn, and different sorghums; studies of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; natural crossing in rice; anatomy and microchemistry of the cottonseed (E. S. R., 75, p. 41); cultural (including planting) tests with cotton, corn, rice, grain sorghum, sorgo, sugarcane, Sudan grass, flax, sweetclover, wheat, and potatoes; planting of treated and delinted cottonseed; seedbed preparation studies; comparisons of corn and grain sorghums; effects of grain sorghum varieties and corn on succeeding crops; irrigation tests with grain sorghum and cotton; milling and baking tests with wheat; fertilizer trials

with crops in rotation, corn, wheat, oats, rice, potatoes, and cotton; measurement of physical properties of cotton fiber; effects of weathering in the field upon grade, color, and strength of raw cotton; green manures for cotton, corn, and other crops; inoculation studies with legumes, germination and longevity of the seed and control of bitterweed; control of pricklypear; production and germination of buffalo grass seed; pasture improvement and management investigations; trials of crops and seeds mixtures for summer, winter, and permanent pastures; pasture crops on rice stubble; tests of small grain for pasture; soil fertility and moisture conservation studies; run-off water losses in relation to crop production; and crop rotations. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

Permanent pastures for cattle production in the rice area of southwestern Louisiana, J. M. Jenkins (*Louisiana Sta. Bul. 276 (1936), pp. 7*).—Pasture experiments were made in 1933-35 in cooperation with the U. S. Department of Agriculture at the Rice Substation with the aim of determining the permanent pasture crops and practices to supplement native vegetation in raising cattle in connection with rice growing. The plats included several seeds mixtures and also natural growth, variously fertilized and limed.

From 3 to 5 yr. may be needed to establish fairly good pasture on ordinary rice land. Permanent pastures can be established by preparing the soil, fertilizing, seeding recognized pasture plants, and mowing occasionally to control objectionable weeds. The best pasture plants for the section have included Bermuda and Dallis grasses, common lespedeza, white clover, and California bur clover. The most rapid growth was obtained in the experiments from a mixture of white clover, Bermuda grass, and lespedeza. A mixture of Dallis and Bermuda grasses, white clover, and lespedeza provided pasturage for the longest period in the year. Dallis grass has afforded some pasturage in mild winters and it starts to grow in early spring. Bermuda grass begins to grow with the advent of warmer weather and continues until frosted down. On unseeded plats, hop clover, lespedeza, white clover, and Bermuda and other grasses were becoming established. The permanent pasture may be mowed for hay in summer when there is pasturage for the cattle on the fallow rice lands, or special areas can be provided for hay. During this experiment more hay was made on the 3 acres occupied than was required by the 6 work animals on the farm.

Pastures and forage crops in South Africa (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Bul. 18 (1936), pp. 31, pls. 4, fig. 1*).—This publication includes articles entitled Pasture Research in the Union of South Africa, by I. B. P. Evans (pp. 7–18); Hay and Fodder Grasses and Legumes in the Union of South Africa, by A. R. Saunders (pp. 19–26); Outline of Pasture Work, by J. W. Rowland (p. 27); and The Initiation of Breeding Work on Herbage Crops in South Africa, by S. R. de Villiers (pp. 28–30). No bibliographies are included since ample references are included in *Herbage Reviews* and *Herbage Abstracts*.

Fertilizer experiments with hay crops in the Connecticut Valley, F. S. Prince, T. G. Phillips, P. T. Blood, and G. P. Percival (*New Hampshire Sta. Circ. 50 (1936), pp. 15, fig. 1*).—Hay crops including alfalfa-timothy mixtures, red and alsike clovers, and wheat fodder, were grown during the period 1930–35 on variously fertilized and limed plats, largely on Agawam fine sandy loam, in the Connecticut Valley near Claremont. The experiments supplement work with sweetclover (E. S. R., 73, p. 778).

As measured by yield increases by the crops grown, the greatest need was for potash. On the alfalfa-timothy mixture grown during the first 3 yr., potash influenced yields most, being more effective with lime or phosphorus or both,

although phosphorus, nitrogen, and lime all resulted in increases where applied. After plowing and seeding to other crops, returns from phosphorus appeared to increase, probably due to the mixing of the phosphorus applied in previous annual top dressings. Red and alsike clovers responded strikingly to phosphorus and potash, not producing normal yields unless both elements were supplied. Farm manures, it appeared, do not carry enough of these two elements for a normal crop of legumes, and if manure enough is applied to furnish adequate potash and phosphorus much of the nitrogen in the manure would be wasted. Significant results were not obtained from lime applications on red and alsike clover. A reaction of about pH 5.5 was maintained on the unlimed plats.

The stimulation of root formation on alfalfa cuttings, G. W. Burton (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 704, 705, fig. 1*).—Naphthalene acetic acid surpassed indole acetic acid in stimulating formation of adventitious roots from alfalfa cuttings at the New Jersey Experiment Stations. Both compounds caused more roots to be formed per cutting and stimulated slightly earlier formation than with untreated cuttings. Cuttings from the tip of the stems formed longer adventitious roots than those taken farther down the stem in both treated and untreated lots and also rooted more frequently. Preliminary determination of the proper concentration of stimulating substances and of duration of treatment was found essential, since injury resulted from over treatment.

Varietal differences in response to treatment are illustrated. The greater abundance of adventitious roots and their more nearly horizontal position on Hardigan alfalfa compared with Hairy Peruvian suggest that the abundance and angle of adventitious roots so formed may be in close correlation with abundance and angle of branch roots on the parent plant. Hardigan has a well-branched root system with the branches approaching right angles, while Hairy Peruvian has a distinct taproot with its few branches assuming a more nearly perpendicular position.

Barley production in Colorado, 1928–1935, D. W. Robertson, D. Koonce, J. J. Curtis, and J. F. Brandon (*Colorado Sta. Bul. 431 (1936), pp. 36, figs. 7*).—Varietal recommendations based on extensive variety tests with barley include the Trebi, Colsess, Hanneben, Wisconsin Pedigree No. 38, and Velvet varieties for irrigated conditions similar to those at the station; Trebi and Colsess for high-altitude irrigated districts as at Fort Lewis; and Club Mariout, Flynn, and Vance Smyrna for dry land from studies at Akron in cooperation with the U. S. Department of Agriculture. As in an earlier bulletin (E. S. R., 65, p. 33), cultural methods and irrigation practices considered suitable for the several regions are outlined, barley diseases and control measures are indicated, and agronomic data are presented for the barleys tested, with descriptions of the recommended varieties.

White clover, E. A. Hollowell (*U. S. Dept. Agr. Leaflet 119 (1936), pp. 8, figs. 3*).—Practices for growing white clover (*Trifolium repens*) for pasture and for seed are outlined, with remarks on its adaptation, pollination, diseases and insects, and on the characteristics of the three recognized forms—common white Dutch, Ladino, and English wild white clovers.

A comparison between Mexican June and three other varieties of corn for summer planting, C. K. McClelland (*Jour. Amer. Soc. Agron. 28 (1936), No. 10, pp. 799–806*).—Variety-date-of-planting tests over extended periods at the Arkansas Experiment Station and at Scott and Marianna, Ark., reported for plantings made June 1 and 15 and July 1, showed Mexican June, closely followed by Paymaster, to markedly surpass Funk 90 Day and Hastings Prolific corn for summer plantings.

A method for studying resistance to drought injury in inbred lines of maize, J. W. HUNTER, H. H. LAUDE, and A. M. BRUNSON (*Jour. Amer. Soc. Agron.*, *28 (1936), No. 9, pp. 694–698, fig. 1*).—By testing 14-day-old corn seedlings for 6.5 hr. in a chamber with temperature controlled at 140° F. and with a relative humidity of about 30 percent, the Kansas Experiment Station cooperating with the U. S. Department of Agriculture found it possible to distinguish among strains as to drought tolerance. Essentially the same order of relative resistance obtained with the seedlings was noted for the plants in the field. Lines susceptible to top-firing under field conditions showed marked injury in the testing chamber in 3 to 5 hr., those susceptible to base-firing showed injury in 4 to 6 hr., and resistant lines showed little or no injury after 6.5 hr. When returned to good growing conditions following exposure to high temperature, plant survival was 0 percent in lines susceptible to base-firing, 0 to 25 percent in those susceptible to top-firing, and 50 to 100 percent in resistant lines.

Carbohydrate content of cotton plants at different growth periods and the influence of fertilizers, D. R. ERGLE (*Jour. Amer. Soc. Agron.*, *28 (1936), No. 10, pp. 775–786, fig. 1*).—Periodic changes in concentration of certain carbohydrate fractions of the cotton plant and the effect of fertilizers on these concentrations, determined from the time of emergence from the soil to the time of first picking, were studied near Elgin, Tex., by the U. S. D. A. Bureau of Plant Industry.

The total sugars, representing the soluble carbohydrates, decreased in concentration in the plant tops between the stages of seedling and square formation, after which the trend in concentration was upward and increased rapidly during active boll formation, the rate of increase diminishing as the bolls approached maturity. At maturity, when the bolls began to open, the total sugars began decreasing in concentration.

Except for the period of active boll formation, when the concentration of total sugars in both tops and roots increased rapidly, the course of changes in concentration of total sugars in the roots tended to be opposite to that in the plant top. During the period of study, the concentration of total sugars in the roots exceeded that in the tops. The diose sugars of the roots exceeded by a large margin the concentration of monose sugars. In the tops the difference in concentration of the two sugars was influenced by the development stage and the fertilizer. In general, during the latter stage of boll formation, July 9 to August 6, the monose sugars exceeded in concentration the diose sugars. The monose sugars in the tops and the diose sugars in the roots were the best indicator of the effects of fertilization on the soluble carbohydrates. Polysaccharoses, representing the insoluble or storage carbohydrates, were in greater concentration in the roots than in the tops. In general, the course of the changes in concentration for both roots and tops was upward throughout the growth periods studied, the rate of change being greater in the roots.

The plants receiving complete fertilizers had a higher level of soluble and insoluble carbohydrates in both tops and roots during the latter development stages than did unfertilized plants or those fertilized with nitrogen and phosphorus separately. Phosphorus alone tended to effect a higher level in the plant tops, while nitrogen alone did not consistently affect the soluble carbohydrates in either tops or roots but did tend to effect a lower concentration of insoluble carbohydrates near the end of the season. Plant growth and yields of seed cotton were increased by fertilizer applications, the largest returns resulting from a 9–3–3 followed by a 3–9–3 fertilizer. These mixtures also produced the most cotton at the first picking, showing an early stimulating effect on growth and square and boll formation and resulting in earlier maturity. The greater carbohydrate content of the plants correlated with larger plant

growth and larger yields. The total carbohydrate content expressed as percentage of green plant or as grams per plant was greatest in plants grown with these two fertilizers.

Studies in Indian millets.—*The types of jowar isolated at the Government Research Farm, Cawnpore*, T. S. Sabnis (*Agr. and Livestock in India, 6 (1936), No. 4, pp. 506–516, pls. 7*).—Distinctive characters of 63 types of sorghum are described with illustrations.

The tillers of the pearl millet (Pennisetum typhoideum (Rich.)), G. N. R. Ayyangar and P. V. Hariharan (*Madras Agr. Jour., 23 (1935), No. 12, pp. 474–477, pls. 2*).—From studies at Coimbatore are described the development of tillers on pearl millet, the flowering sequence of the tiller and branch heads, and the general organization of the vegetative and reproductive phases.

Bristled cumbu (pearl millet), G. N. R. Ayyangar and P. V. Hariharan (*Madras Agr. Jour., 24 (1936), No. 7, pp. 235–237, pl. 1*).—In varieties of pearl millet studied, as the bristles were longer the shedding of the fascicles increased and the density of the grain on the spike decreased. The condition in which the bristles remain below the surface of the grain is recessive to that in which the spikes show bristles from short to full length.

***Comparative influence of different tillage practices on the yield of the* Katahdin potato in Maine**, P. M. Lombard (*Amer. Potato Jour., 13 (1936), No. 9, pp. 252–255*).—Pre-emergence tillage followed by one deep cultivation, a rather general practice in the Presque Isle section of Maine, gave yields, 1931–33, that did not differ significantly from those obtained after pre-emergence tillage followed by five cultivations in cultural tests at Aroostook Farm.

Irish potato fertilizer experiments, H. P. Cooper, W. D. Moore, and R. W. Wallace (*South Carolina Sta. Circ. 55 (1936), pp. 12*).—Fertilizer tests with potatoes made, 1934–36, on farms in the Charleston truck area in cooperation with the U. S. Department of Agriculture showed marked increases in yield to follow application of manganese sulfate. The greater response in 1934 than in 1935 or 1936 seemed due in part to the application of manganese and other amendments to a large proportion of the truck soils during the last 3 yr. in compliance with earlier recommendations of the station. Recent indications were that the content of certain minor plant nutrients rather than the form of nitrogen accounts for the larger yields secured from the use of organic materials. Where the minor plant nutrients were supplied, larger yields were secured from materials in which all the nitrogen was in the water-soluble nonprotein form.

Effects of potassium fertilization on the starch content of potatoes [trans. title], W. Wöhlbier and K. Meifert (*Biedermanns Zentbl., 65 (1936), No. 7–9, pp. 321–333*).—This review covers 82 titles.

Bibliography on potato (Solanum tuberosum L.), compiled by N. Fermeren (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 13. ser., No. 1 (1933), pp. 307–376*).—This selected classified list of non-Russian publications up to 1930 comprises over 1,880 references.

Ramie: A critical survey of facts concerning the fiber bearing plant "Urtica nivea", G. L. Carter and P. M. Horton (*La. State Univ. Studies, No. 26 (1936), pp. [11]+100, pl. 1, figs. 2*).—This publication reports an investigation by the Louisiana Institute of Industrial Research in which attention was paid to yields of fiber per acre, factors affecting yields, stripping the ribbons from the stalk and their purification, and the economics of the production and purification of the fiber. A bibliography of literature pertaining to ramie, including 257 references and abstracts of the more important articles, is appended.

It is concluded that ramie can be grown in the Gulf Coast States with very little difficulty, and under ordinary conditions can be made to produce 25 tons

of green plants per acre containing about 500 lb. of pure fiber each year. To compete with imported, partially purified China grass at 10 ct. per pound, unpurified domestic ribbons must be produced to sell for less than 5.7 ct. per pound. The cost of cultivating, fertilizing, and harvesting ramie in Louisiana has been found to be 1.82 ct. per pound of raw ribbons, which leaves a margin of 3.88 ct. per pound with which to care for the grower's profit and the cost of removing the ribbons from the stalks. To introduce the culture of ramie into the United States on a commercial scale employing hired labor, it is held necessary to perfect a mechanical method of separating the stalk from the ribbons. The method must entail low labor and power charges, and produce a fiber free from mechanical injury.

Effect of date of seeding on the length of the growing period of rice, J. M. JENKINS (*Louisiana Sta. Bul. 277 (1936), pp. 7*).—Twelve rice varieties were grown, 1929–33, at the Rice Substation at Crowley in cooperation with the U. S. D. A. Bureau of Plant Industry to determine the number of days from emergence of the plants to emergence of the first panicle, when planted at 2-week intervals from March 1 to June 15, inclusive. The growing period of each variety shortened after reaching the maximum as the seasonal planting dates advanced, although there was a decided difference in the percentages of shortening. Varieties tending to have a relatively fixed length of growing period included Iola, Fortuna, Rexoro, Early Prolific, Delitus, and Vintula. Varieties tending not to head until a certain time in the fall and thereby greatly lengthening or shortening their growing periods included Caloro, Blue Rose, Wataribune, Acadia, Shoemed, and Honduras. Rices with growing periods of approximately fixed lengths are considered desirable for farmers who want to grow the same variety on a large acreage. Rices that materially shorten their growing periods are held very desirable for one forced to sow his crop late in the spring.

Sagrain in the Yazoo-Mississippi Delta, R. KUYKENDALL (*Mississippi Sta. Bul. 314 (1936), pp. 24, figs. 19*).—Planting, spacing, fertilizer, pasture, and curing experiments with sagrain (said to be a selected strain of Schrock) were made at the Delta Substation, 1927–35.

Sagrain produced its highest grain yields on Sharkey sandy loam when planted April 15 and its highest forage yields when planted May 1 to 15. Spacing of from 4 to 6 plants per hill in hills 13 in. apart on Sharkey clay loam produced maximum average grain yields and 5 or more plants produced the highest forage yields of sagrain alone. Six or more plants per hill produced the highest yields of both grain and stover with soybeans in alternate hills. While the soybeans reduced the sagrain yields considerably when the total crop was removed each year, the beans from the soybeans and the better quality of feed offset the reduced sagrain yields. Considerably higher yields were obtained from sagrain and soybeans than from corn and soybeans, and the yields of succeeding cotton were about the same. Slightly higher yields of cotton were obtained after Biloxi soybeans than after other varieties used with sagrain.

Increases over the average check yield of 16.1 bu. per acre, due to application of nitrogen at the rate of 30 lb. per acre, amounted to 10.4 bu. from leunasalpeter, ammonium sulfate 10.3, calurea 9.8, calcium nitrate 9.8, sodium nitrate 9.7, and cyanamide 7.3 bu. The 150-lb. rate per acre of applying ammonium sulfate was more economical than other rates ranging from 75 to 263 lb., and application (30 lb. of nitrogen per acre) when the sagrain was about 12 in. high gave slightly higher grain and forage yields. Only slight residual effects on sagrain accrued from commercial nitrogen applied on preceding oats.

About 1.5 acres of sagrain and soybeans per head sufficed to carry mules through the summer and fall idle period, July 15 to December 15. Shocking sagrain forage two bundles deep on each side of a ridge pole or farm fence was the most satisfactory and economical method of curing and of storing in the open during winter.

Seed mottling in soybeans, F. DIMMOCK (*Sci. Agr., 17 (1936), No. 1, pp. 42–49, fig. 1; Fr. abs., p. 49*).—Studies made on a number of varieties and strains of soybeans, particularly O. A. C. No. 211, grown at the Central Experimental Farm at Ottawa, Canada, showed that both environment and heredity definitely influence mottling in soybean seed. All varieties tested were found more or less subject to mottling. Selection of strains highly resistant to mottling was suggested as a means for reducing this abnormality.

The sweetness of the wild sugarcanes of India, T. S. VENKATRAMAN (*Agr. and Livestock in India, 6 (1936), No. 4, pp. 517, 518*).—Sucrose percentages in types of *Saccharum spontaneum* secured from Bihar and grown at Coimbatore ranged from 0.56 to 17.49 percent, and other types of *S. spontaneum* 3.04 to 7.93 compared with Uba 16.04, Co. 213 13.66, Co. 290 14.76, C. P. 807 16.49, and Striped Tanna 18.14.

Rates of seeding wheat and other cereals with irrigation, R. E. HUTCHISON (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 699–703, fig. 1*).—The rate of seeding experiment with cereals grown under irrigation, here reported on, was made at an altitude of 4,139 ft. at the Harney Substation, Burns, Oreg., where occur frequent frosts early in the growing season and a relatively large amount of sunshine and low humidity. Federation wheat planted at from 33 to 129 lb. per acre, 1932–35, averaged more than 4 heads per plant for the lightest rate, gradually decreasing to about 1.5 heads from the heaviest seeding. Thinner stands produced more heads per plant and more grain per head than the thicker stands. Rates of from 61 to 129 lb. per acre resulted in a fairly uniform average yield of both grain and straw; the optimum rate was 96 lb., less seed being insufficient to control weeds on foul land. Baart wheat, in 1934, showed similar trends with a lower average yield than Federation.

Trebi and O. A. C. No. 7 barley during 2 yr. made about the same number of heads per lineal foot for seeding rates of from 44 to 116 lb. per acre, only the 44-lb. rate yielding decidedly less than the higher rates. Markton oats, in 1933, gave similar yields for rates of from 58 to 135 lb. per acre and inferior yields for the 45- and 50-lb. rates. Beardless spring rye per acre gave a fairly uniform yield for all 8 rates of from 33 to 113 lb. More plants per lineal foot and heads per plant resulted from rye than from any other cereal. Very low rates of seeding tended to be compensated for by increased tillering.

Cultural methods for winter wheat on non-irrigated lands in northeastern Wyoming, P. K. THOMPSON (*Wyoming Sta. Bul. 218 (1936), pp. 12, fig. 1*).—Seedbed preparation and planting experiments were made with Kanred winter wheat on the Campbell County (Gillette) experiment farm, 1927–35.

Summer fallow prepared May 1 returned higher yields than when prepared June 1 or July 1. Wheat planted with a furrow drill outyielded that planted with a common drill on all dates and for all methods of preparing summer fallow, except on fallow duckfooted May 1. Wheat furrow drilled on oat stubble, bean ground, or 84-in. corn rows yielded less than that sown on fallow. Seedings made September 15 with a furrow drill outyielded earlier or later seedings. A planting rate of 30 lb. of seed per acre has given the highest yields and 45 lb., 0.5 bu. less per acre. In dry seasons, the lighter seeding rates gave the highest yields. The production cost per bushel was more on summer fallow prepared May 1 than where wheat followed corn, beans, or oats, but the higher yield after summer fallow made that method

more profitable. The best and most profitable yields in rotations were made on summer fallow.

Effect of source, quality, and condition of seed upon the cold resistance of winter wheats, C. A. Suneson and G. L. Peltier (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 687–693*).—Winter wheat seedlings, both field and greenhouse grown, and mostly in the 5- to 8-leaf stage of development, gave highly significant hardiness differences within the same varieties when different sources of seed were compared at the Nebraska Experiment Station in cooperation with the U. S. Department of Agriculture. When several specific variates were tested to establish their relationships to differences in hardiness, variables such as seed size and protein content gave no consistent differences, while postmaturity factors, such as sprouting, weathering, or severe mechanical injury, gave significant differences in hardiness. While the latter results extend the scope of seed variations, they fail to account for most of the differences in hardiness observed in the regional collections of the common winter wheat varieties considered. See also an earlier note (E. S. R., 71, p. 771).

Effect of defoliation upon the cold resistance of winter wheat, C. A. Suneson and G. L. Peltier (*Jour. Amer. Soc. Agron., 28 (1936), No. 10, pp. 807–809*).—Defoliation of field-grown Blackhull and Cheyenne winter wheat plants in the early tillering stage reduced cold resistance in cooperative studies by the Nebraska Experiment Station and the U. S. Department of Agriculture. The decrease in survival was approximately in proportion to the degree of defoliation, indicating the importance of photosynthesis during the hardening process.

Results of seed tests for 1936, B. G. Sanborn and L. J. Higgins (*New Hampshire Sta. Bul. 293 (1936), pp. 24*).—The germination and percentages of purity are tabulated for 430 official samples of field crop seed collected from dealers in New Hampshire during the year ended June 30, 1936.

Preliminary studies on the carbohydrates in the roots of bindweed, C. G. Barr (*Jour. Amer. Soc. Agron., 28 (1936), No. 10, pp. 787–798, figs. 6*).—The trend of the root carbohydrates of bindweed under control measures was studied in 1935 at the Colorado Experiment Station to obtain information on the effect of cultivation upon the root reserves.

The percentage of reducing sugars in bindweed roots cultivated at 3-week intervals was markedly lower than in roots of undisturbed plants, and a slight further decrease was found in roots from the first foot level of plants cultivated biweekly. The roots of plants cultivated at 3-week intervals contained from 55 to 60 percent less sucrose than the roots of undisturbed plants, while those cultivated biweekly showed 92 and 99 percent depletion of sucrose in the first and second foot levels, respectively. The total sugar content followed very closely the sucrose trend and was governed chiefly by this fraction. The polysaccharide fraction, extracted with 10 percent alcohol and designated "dextrin", showed slow but constant depletion as a result of cultivation. Roots of plants cultivated weekly contained 58 percent of the quantity of dextrin found in the check plants.

The starch content of bindweed roots decreased markedly when the plants were cultivated at 3-week intervals, while more frequent cultivation resulted in but very little additional depletion of this fraction.

The marked depletion of the total carbohydrates in the roots of plants which had undergone systematic cultivation is emphasized. Prolonged cultivation, either occasional or frequent, caused a significant decrease in the food materials stored in the roots, found true in plants under cultivation at intervals of 3 weeks or less. Slight additional decrease was observed with increased frequency of cultivation.

Some metallic and inorganic compounds used as weed-killers (*Bul. Imp. Inst.* [*London*], *34* (*1936*), *No. 2, pp. 189–211*).—The use of copper, iron, zinc, and ammonium sulfates, sulfate mixtures, kainite, arsenic compounds, chlorates, cyanamide, ammonium thiocyanate, sulfuric acid, and other chemicals and herbicides is reviewed, text references being supplemented by an appended classified bibliography including 64 titles.

HORTICULTURE

[Horticultural investigations conducted by the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 32–34*).—Brief comments are presented on the progress of studies of varieties of apples, cherries, grapes, plums, and strawberries; of pruning, cultural, and fertilizer trials with sour cherries; the breeding of Spanish type onions; curing and storage of onions; strains of onions; development of tipburn-resistant lettuce; and the improvement of pyrethrum.

[Horticultural investigations conducted by the Texas Station], S. H. Yarnell, J. F. Rosborough, H. F. Morris, P. R. Johnson, W. H. Friend, E. Mortensen, J. F. Wood, R. H. Stansel, R. A. Hall, H. M. Reed, L. E. Brooks, J. J. Bayles, L. R. Hawthorn, J. Whitacre, R. H. Wyche, W. J. Bach, S. W. Clark, W. H. Dameron, and H. P. Smith (*Texas Sta. Rpt. 1935, pp. 25–35, 145, 146, 151, 152, 165, 173, 206, 207, 213–216, 217, 228, 243–248, 249, 250, 251, 262–267, 269–276*).—In again presenting progress reports (E. S. R., 75, p. 45), brief information is given on studies at the main station and substations on the adaptation of various fruits, vegetables, and ornamentals; breeding of blackberries and dewberries; culture of the blackberry, grape, and tomato; rootstocks of citrus; culture of grapefruit; deterioration of bearing grapefruit orchards; heating of grapefruit orchards; storage of oranges and grapefruit; effects of culture, fertilizers, sprays, etc., on the maturity of grapefruit; breeding of figs; processing of figs; rootstocks for grapes and pecans; breeding and culture of strawberries; cytology of the chromosomes in hybrids of citrus, strawberry, raspberry, and blackberry; fertilizer for asparagus and blackberries; storage of cucumbers; irrigation of spinach; breeding of tomatoes; nature of the puffing of tomato fruits; breeding of peaches; the breeding of hardier kinds of oranges; and the propagation of date palms.

Commercial mushroom production: A highly competitive, scientific business, C. H. Mahoney, E. A. Bessey, and E. I. McDaniel (*Michigan Sta. Circ. 158* (*1936*), *pp. 20*).—General information is presented on culture, marketing, and the control of insects and diseases.

Commercialization of hybrid-vigour in the tomato, J. W. Hadfield and R. A. Calder (*New Zeal. Jour. Agr., 53* (*1936*), *No. 3, pp. 139–146, figs. 3*).—Yields taken on seedlings obtained from crosses made at the Plant Research Station, Palmerston North, New Zealand, between various tomato varieties showed clearly the stimulating effect of hybrid vigor. The more distinct the parents, the greater the effect of heterosis. There was a definite trend toward early maturity in the hybrids.

Studies of tomato defoliation, J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 32* (*1935*), *pp. 528–531*).—Determining the percentage of defoliation by measuring the length of stems defoliated and the length of stems with leaves attached, it was found, in studies at the Indiana Experiment Station, that under field conditions younger plants are less defoliated, have a higher nutrient level, and less weight of fruit and foliage. In controlled trials in the greenhouse, the nutrient condition was found to exert a profound effect on defoliation, amounting from 7 to 12 percent in the case of complete nutrients and from 90 to 100 percent with water alone applied to sand. The omission of a

single element increased defoliation as compared with full nutrients. The need of applied nutrients, even on good soil, was indicated in the better retention of foliage. The long producing period of the tomato as compared with grain crops is pointed out.

Some effects of sprays on the growth and transpiration of tomatoes, N. F. Childers (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 532–535*).—Field investigations at the Missouri Experiment Station showed that bordeaux mixture applied to tomato plants growing under drought conditions reduced markedly plant growth, yield, and size of fruit. A combined spray of bordeaux mixture and heavy oil induced a similar but not so striking response. Heavy oil alone had little effect on yield and fruit size but retarded maturity. The largest plants were in the heavy-oil group. Mature Marglobe plants growing in pots in the greenhouse were supplied, during the dull and cloudy days of January, with bordeaux, copper sulfate, colloidal copper, heavy oil, and other materials. The experiment was repeated in lat eApril when temperature and sunlight favored high transpiration. Over a period of 10 days, under both low and high temperature, bordeaux and other copper sulfates had little effect on transpiration. Heavy oil caused a marked reduction, especially in April, but at the end of 10 days the oil-sprayed plants had returned to normal.

Accomplishments in fruit breeding by State and Federal experiment stations, W. H. Alderman (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 13–20*).—In summarizing information obtained from 75 questionnaires, the author reports a great expansion in fruit breeding activities in recent years. Of a total of 449 new fruits which have been named and introduced, 321 were disseminated since 1920. There was noted a tendency to disseminate new fruits without adequate testing, although, in general, it is believed that tree fruits require from 20 to 25 yr. and small fruits from 8 to 15 yr. of preliminary trials. A tabulation is presented of State and Federal agencies concerned with fruit breeding, with lists of the varieties introduced.

The relative abundance of pollen production by varieties of apples, H. E. Knowlton (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 7–9*).—Counts made at the West Virginia Experiment Station in 1933 on the actual number of pollen grains per anther in Red Duchess, York Imperial, Delicious, and Rome Beauty apples showed averages of 5,980, 5,215, 7,906, and 6,135, respectively. Using a Neubauer hemocytometer, studies were made in 1934 and 1935 on 14 varieties. In 1935, the range for 13 varieties was from a maximum of 7,211 in Delicious to a minimum of 2,188 in Northwestern. There was a notable variation between anthers in a single variety. For example, 10 readings on Red Duchess in 1933 ranged from 9,030 to 4,077, with a mean of 5,980. Differences of about 1,000 grains were necessary to show significance.

A study of the relation of size of apples to number of seeds and weight of spur leaves, A. E. Murneek and G. C. Schowengerdt (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 4–6*).—Asserting that the relative size of the apple is determined apparently by two factors—leaf area near the fruit and the number of seeds, the authors discuss the results of studies at the Missouri Experiment Station in which it was observed that despite ample foliage, self-pollinated apples were no larger and frequently smaller than cross-pollinated ones of the same variety. Although the number of seeds was less in the selfed fruit, the average weight of fruit per seed was much higher.

Observations on several hundred bearing Wealthy spurs, collected at random from the interior and exterior of a large tree bearing a heavy crop, showed a good correlation between weight of fruit and number of seeds and between weight of fruit and weight of the spur leaves. Interior apples showed a significantly higher correlation between weight of fruit and number of seeds than

did outside apples. No correlation was found between leaf weight and seed number. Flowers poorly situated with reference to organic food supply needed, apparently, more efficient pollination that those more favorably located.

Some results with the electrical maturity tester in measuring developmental and ripening changes in the apple, C. O. Hesse and A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 210–212, fig. 1*).—Readings taken by the Maryland Experiment Station with the electrical maturity tester (E. S. R., 67, p. 680) on Jonathan and Grimes Golden apples, harvested at intervals throughout the growing season from high and low vigor trees, showed a gradual downward trend for fruit from both groups of trees until September 6, when a definite rise was evident. This rise occurring from 7 to 14 days ahead of the commercial harvest was followed by little change in succeeding readings. Pressure tests from July 30 to September 27 failed to show changes correlated with the electrical readings, and diameter measurements also showed fairly constant increments. In the case of Jonathan, the milliammeter readings were, up to September 6, consistently lower in fruit from the low vigor trees. Size of fruit had little effect on tester readings on stored Grimes Golden and Jonathan apples.

Sterility in pears, M. B. Cummings, E. W. Jenkins, and R. G. Dunning (*Vermont Sta. Bul. 408 (1936), pp. 84, pls. 16, figs. 9*).—In this study of self- and cross-incompatibility in the Bartlett group of pears, the station assembled a collection of 14 varieties, either known definitely to have Bartlett ancestry or to closely resemble this variety, and also 7 species including, in addition to *Pyrus communis*, various oriental and other pears.

In the field work, there were made under controlled conditions many cross- and self-pollinations in order to study compatibilities and the effects of different pollens on fruit and seed development. Considerable variations occurred in the results of the same cross from year to year due mainly to environment. For example, selfing of Bartlett resulted in 18 fruits in 1933 and only 3 in 1935. Sterility in this variety was thus not constant, with fruit formation more common than seed formation. Similar differences in fertility were observed in the crosses. On the whole, the number of viable seeds secured by self-pollination was very small and their viability almost nothing. There appeared to be no essential relation between size of fruit and the number of good seeds.

Laboratory studies included an investigation of microsporogenesis in the Bartlett pear, the growing of pollen on nutrient agars, and tracing the development of the pollen tubes in various cross- and self-pollinations. There was observed no irregularity in chromosome behavior in the reduction division of the pollen mother cells of the Bartlett pear, yet in an occasional anther sac there was detected a complete degeneration of the pollen mother cells. The great majority of the microspores matured into normal pollen grains. In the pollen germination tests, very few morphologically imperfect grains were found in any of the species and varieties except in *P. nivalis*. Apparently, sterility in the pear is not due primarily to defective pollen. Observations on Bartlett and Dempsey pollen tubes grown on agar at temperatures of 58° and 80° F. showed more rapid growth at 80° whether on glucose or sucrose. Pollinations of Bartlett flowers, at various stages of development, indicate that the most favorable results are secured from 1 or 2 days before and up to full anthesis. An attempt to induce fertilization of self-pollinated flowers by cutting away part of the style gave negative results. Observations on the comparative growth of pollen tubes in selfed and crossed blossoms of a single variety showed that tubes in the crossed flowers continue their growth steadily

whereas in selfed blossoms marked retardation occurs at the end of the first 24 hr. with complete cessation before fertilization is accomplished.

The effect of the personal equation in setting on the stand of black raspberry plants, R. H. SUDDS (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 415, 416*).—Observations at the Pennsylvania Experiment Station on the survival of Cumberland and Plum Farmer plants, set in adjacent rows at the same time and from the same bundles by two different workers, showed 97 and 87.9 percent success, respectively, for one worker, and 87.1 and 73.5 for the other. Comparable observations on the results secured by two other workmen setting Cumberland plants showed 92 and 45.5 percent survival.

Flower bud formation in the Latham raspberry, J. C. SNYDER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 417–422, figs. 11*).—Buds collected at different periods throughout the year from Latham plants growing at Ames, Iowa, were examined microscopically for the first visible evidence of flower initiation, namely, the broadening and flattening of the floral axis. The first evidence was seen in spring at the time the most advanced buds had produced shoots approximately 1 in. long. A time difference of as much as 3 weeks was recorded between the first and last buds on a single cane. Some buds, irrespective of their position, remained in a vegetative condition much longer than others, but otherwise differentiation occurred in acropetal order on the cane.

Fertilizer treatments of red raspberries, A. E. STENE (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 411–414*).—Results of fertilizer trials at the Rhode Island Experiment Station in which complete fertilizer was compared with mixtures lacking in one ingredient showed that potassium was as important as nitrogen, if not more so, and that phosphorus was of least value. Weights of the canes on the several plats showed no close correlation between yield and weight of canes, but the trends were similar. Attempts to correlate the prevalence of crown gall with fertilizer treatments gave no clear-cut evidence.

Handling, precooling, and transportation of Florida strawberries, D. H. ROSE and E. A. GORMAN, JR. (*U. S. Dept. Agr., Tech. Bul. 525 (1936), pp. 58, figs. 20*).—In an attempt to ascertain the most satisfactory and economical methods of handling strawberries in commercial carlots, observations were made on 36 cars of Florida strawberries, of which 27 were precooled, 16 with bunker blowers, 10 with pressure-type fans, and 1 with a motor truck apparatus. Washing of strawberries, a general practice in Florida, did not appear to be an important factor in transit provided the berries were firm and sound. In laboratory tests, it was established that wetting berries hastens the rate of cooling. Pressure readings on strawberries held at different storage temperatures indicates that berries are usually firmer at low than at high temperatures.

The percentage of salt that could be used safely in precooling varied with the temperature of the berries at the time of loading and also with prevailing outside temperatures. For example, in cool weather when outdoor temperatures were liable to drop below 32° F., 3 percent of salt was the maximum that could be safely used in precooling, whereas in warm weather 4 percent could be safely used at the time of loading. In precooling operations, the ice should not be chopped finer than 50-lb. pieces until within approximately 1 ft. of the hatch bottom. At this point, the surface should be leveled enough to retain the salt. Above the salt, 25-lb. pieces of ice may be safely used. Empty spaces in the upper section of the bunker must be filled with small pieces of ice to prevent short circuiting of the air over the top. The use of large pieces of ice facilitates the movement of air and increases its contact with the cooling surfaces. Before re-icing, the mass should be piked down thoroughly. After the berries are cooled, smaller pieces of ice should be used so as to make the ice last longer.

When 600 lb. of salt are used, the authors suggest that it be applied in two lots, 400 lb. at the beginning and 200 lb. about the middle of the precooling period. With 400 lb. the ice should be added in the beginning. A temperature of 40° or slightly lower at the top and bottom doorway is desirable in cars of berries as they leave the point of origin.

Observations on trucklots of strawberries shipped northward from North Carolina showed fruit temperature to follow rather closely outdoor temperatures, and led to the suggestion that trips should be made as much as possible during the night.

Developments in growing muscadine grapes in the South, J. G. Woodroof (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 447–449*).—Propagation studies with cuttings placed in shaded or open beds were practically fruitless, with a maximum of only 3 percent of rooting in the Thomas variety. Excellent results were secured from layering vines of all ages up to 100 yr. A single 20-yr. vine could produce about 2,000 rooted plants. December proved to be the best month for laying down mature vines.

New varieties and pollination of muscadine grapes, W. D. Armstrong (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 450–452*).—From crosses made by the Georgia Experiment Station between the Flowers, Thomas, and Scuppernong varieties and males of different colors, there were produced 11 varieties worthy of naming—Hunt, Dulcet, Qualitas, Irene, Spalding, Howard, Stuckey, Lucida, Brownie, November, and Yuga. In a planting of Hunt established in 1928 to determine the proper distribution of male vines, records show by far the greatest percentage of high-yielding vines was located near the males. A study of insect visitors during the blooming season led to the conclusion that two species of *Halictus*, small black bees, are of major importance in pollination.

Three mutations of Vitis vinifera, E. Snyder and F. N. Harmon (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 435, 436, figs. 4*).—During the seasons of 1934 and 1935, there were observed by the U. S. Department of Agriculture in California vineyards three mutations, namely, large- and small-berried Sultaninas and a seeded Panariti. The large berry Sultanina occurred as whole vines or in association with normal fruit. The vines of the large berry form had thicker canes, shorter internodes, and thicker and coarser foliage. In the case of the small berry Sultanina, the vines resembled the normal. This was also true in the seeded berry, Panariti, mutation in which the berries produced were in perfect clusters of large oval-seeded fruit.

Bud mutation in the vinifera grape.—II, Sultanina gigas, H. P. Olmo (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 437–439, figs. 2*).—Stating that large-berried strains of Sultanina, propagated by the California Experiment Station at Davis, have retained this characteristic, the author in this second contribution (E. S. R., 73, p. 182) describes the plant and fruit both of which are enlarged. The desirable seedless characteristic of the parental Sultanina is retained in the mutant. The giant form fails to bear well-filled clusters consistently. Cluster thinning improved the set but, in some cases, the clusters were so compact as to fracture the berries. The cluster stems and pedicels are brittle in the giant form. The mutant is classed as an autotetraploid, arising by somatic mutation, apparently a failure of cell division after the division of the chromosomes. Giant forms of Muscat of Alexandria and also of Flame Tokay are also growing at Davis. Preliminary crosses showed little or no difficulty in crossing giant forms with normal diploids or vice versa.

Effect of seed development on the growth of grapes, A. J. Winkler and W. O. Williams (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 430–434, fig. 1*).—Measurements taken at the California Experiment Station, Davis, on approximately 100 tagged berries of each of several varieties of vinifera grapes, selected

because of their various types of seed development, showed, except in the case of Sultanina, a characteristic temporary decrease in berry diameter expansion. The growth stages divided themselves into three fairly clear periods—rapid inaugural growth, depressed growth, and final enlargement. The lack of periodicity in Sultanina, a seedless grape, is believed to indicate that seeds may be the causal factor of periodicity in varieties with seeds. Trunk girth increments, shoot length growth, and starch and sugar content of the basal sections of the canes, followed in the Carignane variety showed growth to practically cease by the beginning of the second or depressed period in berry development. Carbohydrate accumulation in the canes, on the other hand, proceeded steadily, suggesting that depressed growth of berries cannot be associated with food shortage. Defoliation to the extent of 90 percent at the end or beginning of the second period did not change the course of development of the berries. Periodicity is believed to be as inherent a quality as fruit color, size, or texture.

Fertilizer treatments of grapes, A. E. Stene (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 453–455*).—At the Rhode Island Experiment Station, Niagara, Concord, and Brighton grapes were found to respond very definitely to potash. On the N–P–K plats, the total yields for 4 yr. were 432, 360, and 201 lb. for the three varieties, respectively, as compared with 178, 219, and 46 lb. on the N–P plats, and 328, 317, and 193 lb. on the P–K plats.

Red raspberries responded in the same general order.

Liming vineyards [trans. title], H. Lagatu and L. Maume (*Ann. École Natl. Agr. Montpellier, n. ser., 24 (1936), No. 2, pp. 180–199, figs. 6*).—The addition of calcium lime, dolomitic limestone, or plaster to the manure applied to a soil which, although not acid, showed no effervescent reaction to strong acids, resulted in decreased yields as compared with manure alone. In none of the 6 yr. through which the experiment ran was there noted any marked or consistent increase in calcium in the leaves of vines either manured or manured and limed. The results are said to support the popular opinion of grape growers as to the value of lime.

Color development of Concord grapes associated with the number of leaves per cane, F. B. Cross and J. E. Webster (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 440, 441*).—In this study conducted by the Oklahoma Experiment Station, in which the leaf area per cluster was adjusted by cluster thinning and pruning of the growing canes, it was shown very definitely that any reduction in leaf area affects the development of berry color. A total of 10 or more leaves per cane were required for the best development of color in the Concord grape under Oklahoma conditions. Progress of color development was followed by color photographs and by counts at harvest. Severe pruning and its consequent reduction in leaf area reduced the vitality of the vines seriously.

Chemical analyses of grape juices—variety comparisons, J. E. Webster and F. B. Cross (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 442, 443*).—Tabulated information is presented on the results of analyses of the juices of 28 varieties of grapes grown by the Oklahoma Experiment Station at Henryetta. Compared with northern grown varieties, sugar content was lower, often as much as 3 to 5 percent. Sucrose was found in the juice of every variety but not every year.

Use of the refractometer in studying sugar content of grape juices, J. E. Webster and F. B. Cross (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 444–446, figs. 3*).—Using a multiple prism Bausch and Lomb dipping refractometer, with juice at 20° C. (68° F.), determinations were made by the Oklahoma Experiment Station on 208 samples collected over a 4-yr. period from forty-odd

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varieties. With sugar percentages plotted against refractive indices, the correlation was 0.9247. In studying 174 samples of juice extracted from fruit included in the uneven ripening experiment with the Concord grape, the correlation between sugar percentages plotted against refractive indices was 0.7798. The lower correlation is explained on the basis that many of the Concord samples were taken from vines subjected to abnormal environments.

The growth of citrus in relation to potassium, A. R. C. Haas (*Calif. Citrogr., 22 (1936), Nos. 1, pp. 6, 17, figs. 6; 2, pp. 54, 62, figs. 8*).—Observations at the California Experiment Station, Riverside, on the growth of citrus cuttings in sand and nutrient cultures in which potassium was deficient, showed definite leaf scorch and inhibition of root growth. The leaves showed numerous rough resinous spots which, in some cases, gave the appearance of low temperature injury. Certain phases of scorch resembled tipburn resulting from excessive chlorine. Gum formation was associated with potassium deficiency, deposits occurring on or in the leaves and in the cambium and phloem of the bark. Increased injury from hot, dry winds often occurred in trees lacking in potassium. When the given potassium concentration was extremely low, a high concentration of divalent ions in the cultural solution induced more readily potassium deficiency symptoms.

Use of water by Washington Navel oranges and Marsh grapefruit trees in Salt River Valley, Arizona, K. Harris, A. F. Kinnison, and D. W. Albert (*Arizona Sta. Bul. 153 (1936), pp. 439–496, figs. 26*).—This bulletin presents the results of a 3-yr. study of the water requirements of mature Washington Navel orange and Marsh grapefruit trees growing in the Salt River Valley, where successful culture is dependent absolutely on an adequate supply of irrigation water although in some winters there is sufficient precipitation to meet the needs of trees for several months. Based on readings of soil samples taken at 1-ft. intervals to a depth of 6 ft., it was found that in the majority of the groves 67 percent of the total water used is in the upper 2 ft., 16.6 percent in the third foot, and 10 percent in the fourth foot. It was evident that alternate medium and light applications of irrigation water with not more than one or two heavy applications a year would be the most efficient practice, not only meeting the water needs of the trees but actually saving water. In a year's time, mature Washington Navel trees removed from the soil a little in excess of 2.5 acre-ft. of water. During the same period, Marsh grapefruit trees used about 3.5 acre-ft. These figures exclude water used by cover crops and weeds, loss in run-off, evaporation, or leached below the root zone. In the cool period of winter, the irrigation interval may be safely four times that of summer. It was indicated that, on the average, 25 percent of total amount of water used by the trees in any calendar year would be needed by May 15, 50 percent by July 15, and 75 percent by early September.

Grapefruit maturity studies in the Salt River Valley, R. H. Hilgeman (*Calif. Citrogr., 21 (1936), No. 12, pp. 462, 492*).—On a basis of 847 tests made in 1934 and 1935-36 by the Arizona Citrus Fruit Standardization Service in cooperation with the Arizona Experiment Station, it was observed that if juice percentage is correlated with diameter of the fruit the maximum percentage of juice was not reached in 8 of the 10 groves until December. At this time, fruit was fully colored, containing 35.1 percent of juice by volume, and had attained a sugar acid ratio of 6.35:1. Fruit from groves 20 yr. or older was later in reaching a 6:1 ratio, but the juice increased at a rate fairly comparable with younger trees. The highest percentage of juice was obtained from young trees growing in abundantly watered sandy loam soil.

Pruning studies with Washington Navel orange trees, A. D. Shamel and C. S. Pomeroy (*Calif. Citrogr., 21 (1936), No. 12, pp. 460, 486–489, fig. 1*).—From

data secured over a period of 22 yr. on Washington Navel orange trees, included in a pruning experiment begun in 1914 with trees planted in 1908, the authors conclude that any pruning was detrimental to yields in about the order of the amount of living foliage removed. The reduced yield following the initial pruning was such as to discourage further pruning beyond very light corrective thinning. Apparently with trees of the type included in the study very little pruning is required, at least until the trees are older than those concerned.

Drought injury to ornamental trees, L. R. Quinlan (*Kans. State Hort. Soc. Bien. Rpt., 43 (1934–35), pp. 197–202*).—A detailed record is given of injury to ornamental trees on the campus of the Kansas State College during the years 1934 and 1935.

Dahlia variety test, 1936, H. L. Cochran, D. D. Long, N. LaMotte, and B. E. Phillips (*Georgia Sta. Circ. 111 (1936), pp. 16, fig. 1*).—Observations are presented on promising varieties as observed in tests conducted in cooperation with the Dahlia Society of Georgia. In addition, information is presented on certain cultural, pest control, and miscellaneous problems.

FORESTRY

[Forestry studies by the Texas Station] (*Texas Sta. Rpt. 1935, pp. 217, 221*).—Data are briefly noted as to growth records on slash pine, by H. F. Morris, and the use of various woods for telephone poles, by E. K. Crouch.

Drought of 1934 and its effect on trees in Kansas, L. E. Melchers (*Kans. State Hort. Soc. Bien. Rpt., 43 (1934–35), pp. 195, 196*).—A longer article based on the same study has previously been noted from another source (E. S. R., 76, p. 157).

"The general conclusions reached on the injury sustained by the soft maple, the Scotch pine, the American elm, and the black walnut at Manhattan are in accord with the injury occurring in the nurseries. The Chinese elm seemed to be less injured by the heat and drought than the American elm. The Russian olive withstood the drought extremely well. The very severe injury to the cottonwood, the Lombardy poplar, and several species of willow in the nursery and some of these species along the dried stream beds in Kansas was distinctly a surprise. Such species as the American white birch, the pussy willow, the white pine, jack pine, Colorado blue spruce, and Black Hill spruce were very severely injured in certain counties."

A comparison of roots of southern shortleaf pine in three soils, L. M. Turner (*Ecology, 17 (1936), No. 4, pp. 649–658, figs. 3*).—Observations taken by the Arkansas Experiment Station in trenches dug beneath forty-five 50-year-old southern shortleaf pines distributed equally on Susquehanna fine sandy loam, Caddo silt loam, and Hanceville fine sandy loam showed the Caddo soil, which afforded the most rapid height growth, to contain the most roots, particularly those of large size. Hanceville, the poorest soil as regards the height growth, had the least. Thus, a positive correlation was established between the higher site index and greater cross sectional root area. The better the quality of the site, the larger the trees of any given age and the greater the number and size of roots. The high percentage, 96.7, of total cross sectional area of roots in the upper 18 in. of Caddo soil was presumably related to the flat, poorly drained nature of the soil. Susquehanna and Hanceville soils had 87.1 and 92.5 percent, respectively, of the total cross sectional area of roots in the 18-in. soil.

Factors controlling initial establishment of western white pine and associated species, I. T. Haig (*Yale Univ. School Forestry Bul. 41 (1936), pp.*

[*VIII*]+*149, pls. 10, figs. 2*).—In this study, cooperative between the Yale School of Forestry and the U. S. D. A. Forest Service and conducted on plats established in the Priest River Experimental Forest, Idaho, the role of various important physical factors such as temperature, light, moisture, and character of the surface were investigated with reference to the survival of seedlings of western white pine, lowland white fir, Douglas fir, western larch, western red cedar, and western hemlock. Three neighboring areas, representing clear-cut, part-cut, and a dense uncut stand, were selected as stations, and seed of the six species were sown on prepared quadrats. Instruments, such as recording thermometers, photometers, and atmometers were installed to obtain accurate climatic information.

Among biotic factors, with the possible exception of rodents, damping-off organisms were the most serious, killing from four to five times as many seedlings as did insects and birds combined. Mortality due to fungi and insects varied erratically by habitat, year, and species, but losses from fungi were, except in full shade, materially heavier on duff than on mineral soil.

Of physical factors, insolation and drought were the most important of those affecting initial seedling mortality. On relatively severe cut-over areas insolation was by far the most serious factor, while under full timber drought was most important. Light was not a direct factor in initial mortality. In fact, seedlings were able to survive their first season under intensities as low as 5 percent of full sunlight. Light may be an important indirect factor through its growth effects, particularly initial root penetration. Losses from insolation on cut-over areas were materially higher on duff than on mineral surfaces. Losses due to drought were caused primarily by surface drying and were directly related to root penetration-soil moisture balance.

In general, the species fell into two classes with regard to resistance to adverse physical factors. Western white pine, lowland white fir, Douglas fir, and western larch were relatively resistant on cut-over areas, while western red cedar and western hemlock were relatively susceptible. Of the two susceptible species, the cedar was somewhat hardier. Under the conditions of the experiment, the best survival during the critical initial season occurred under a relatively heavy overwood stand.

The author discusses the application of the results to silvicultural practices and, in the appendix, outlines the statistical analysis employed.

Stand improvement measures for the western white pine type, K. P. DAVIS ET AL. (*U. S. Dept. Agr., Forest Serv., 1936, pp. 63, figs. 4*).—In mimeograph form, there are presented, primarily for Forest Service workers and private timber operators, information on objectives and methods of stand improvement in immature and mature stands. The methods discussed include cleaning, thinning, liberation cuttings, and prunings.

Observations on thinning and management of eastern white pine (Pinus strobus Linnaeus) in southern New Hampshire, R. C. HAWLEY and M. K. JESUP (*Yale Univ. School Forestry Bul. 42* (*1936*), *pp. VII+16, pls. 6*).—Following summarization of data recorded over a period of 30 yr. in sample plats of white pine established near Keene, N. H., the author discusses the results from a silvicultural viewpoint and suggests a plan for growing even aged crops of white pine on sandy soils. Comparing two treatments, no thinning, and six thinnings at 5-yr. intervals, the thinned plat, adding present stand to lumber obtained in the thinnings, had produced a total of 42,680 bd.-ft. per acre as compared with 41,640 bd.-ft. in the unthinned area. Height growth had not been stimulated significantly by thinning. In 1935, the 80 largest trees were larger on the thinned plat than on the unthinned. Income derived

from the sale of lumber has been one of the most important results of thinnings, and in addition, thinning encouraged sturdy reproduction to succeed the present stand.

DISEASES OF PLANTS

The role of amino acids and phenolic compounds in the susceptibility or resistance of plants to diseases, J. Dufrenoy (*Le Rôle des amino-acides et des composés phénoliques dans la susceptibilité ou la résistance des plantes aux maladies. Athênai (Athens): Éd. "Flamma", 1936, pp. 22, figs. 7*).—This paper presents a review and theoretical consideration of the basic physiology of susceptibility and immunity in plants. Many investigators have shown for various diseases that the resistant genotypes are those whose cells react rapidly to parasitic excitation by an accumulation of phenolic compounds in their vacuolar solution. Furthermore, the author has shown that the first microscopic symptom of a metabolic disturbance evident is the tendency of the vacuolar sap to flocculation. In virus or other infectious diseases the phenomena of local immunity are always manifested by a concomitance of the two antagonistic biochemical reactions—production and accumulation in the vacuolar sap of amino acids and glucosides, on the one hand, and of phenolic compounds on the other. If the first reaction dominates the infection, the infection becomes generalized and the plant is "sensitive", while if the second gains the ascendancy the infection tends to become localized.

The cytological study of pathological reactions gives intelligible results only insofar as the basic physiological background of the structural changes is considered. Susceptibility or resistance depends, respectively, on the possibility *of the parasite nourishing itself at the expense of the living host cells and on* the "toxicity" for the pathogen of the products formed by the cell in the face of infection. In the plant a hypersensitivity of the cell is manifested by the formation of phenolic compounds in the vacuolar solution. Intolerance of the cell is the factor for resistance here.

The preparation of gradocol membranes and their application in the study of plant viruses, K. M. Smith and J. P. Doncaster (*Parasitology, 27 (1935), No. 4, pp. 523–542, figs. 7*).—This is an account of the preparation of the W. J. Elford gradocol (graded collodion) membranes and their application to the study of plant viruses. It is shown that the latter clog the membranes, and suggestions are made for the preparation of these virus suspensions for filtration. The effects of virus content, purification, and the pH of virus fluids on their filtration are discussed.

The production of antisera with suspensions of potato virus "X" inactivated by nitrous acid, F. C. Bawden, N. W. Pirie, and E. T. C. Spooner (*Brit. Jour. Expt. Path., 17 (1936), No. 3, pp. 204–207, fig. 1*).—"Antisera indistinguishable from those prepared by injecting suspensions of active virus can be prepared in rabbits by the intravenous injection of suspensions of virus 'X' inactivated by nitrous acid. Both fix complement and flocculate with virus suspensions, but not with the sap of healthy tobacco plants, and both are equally effective in neutralizing the virus in vitro."

***Contributions to the knowledge of the parasitic and saprophytic fungi.*—I, Phomopsis, Dendrophoma, Phoma, and Ascochyta and their relation to fruit rot** [trans. title], H. W. Wollenweber and H. Hochapfel (*Ztschr. Parasitenk., 8 (1936), No. 5, pp. 561–605, figs. 20*).—Twenty species, 1 variety, and 1 form were isolated, determined, and briefly described with special attention to their relations to fruit rot, including 2 species of *Phomopsis*, 3 of *Dendrophoma*, 11 species (including 2 new combinations) and 1 new form of

Phoma, and 4 species and 1 variety of *Ascochyta* (including 2 new combinations). The hosts from which isolations were made included apple, tomato, pear, quince, peach, pumpkin ("Kurbis"), cucumber, *Juglans*, cacao, plum, cherry, strawberry, currant, raspberry, banana, orange, and lemon. Only the genera above noted are here discussed in detail. For them a key is provided to both the genera and species isolated.

Contributions to the knowledge of parasitic and saprophytic fungi.—II, Monochaetia and Pestalotia and their relation to fruit rot [trans. title], H. W. WOLLENWEBER and H. HOCHAPFEL (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 9, pp. 401–411, figs. 7*).—One species of *Monochaetia* and six of *Pestalotia* were isolated, determined, and briefly described. All five *Pestalotia* species tested caused rot in apples.

Toxins of rust (Puccinia), A. I. GREČUŠNIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 2 (1936), No. 8, pp. 335–340*).—Using *P. helianthi*, *P. coronifera*, *P. graminis*, and *P. suaveolens* in the chemicophysiological analyses recorded, the author concludes that the active principle of the rust toxin consists of two simple compounds, viz, ammonia and urea.

Viability of sclerotia of Sclerotium rolfsii after passage through the digestive tract of cattle and sheep, L. D. LEACH and S. W. MEAD (*Jour. Agr. Res. [U. S.], 53 (1936), No. 7, pp. 519–526, figs. 3*).—In experiments by the California Experiment Station, from 8 to 28 percent of the sclerotia consumed in the rations of 7 sheep and 2 cows were evacuated in a whole condition, but examination of the contents of the digestive tract of 2 slaughtered sheep indicated that the remainder were digested or fragmented. From 0.7 to 15 percent of the evacuated sclerotia retained their viability. No viable sclerotia were evacuated by sheep later than 84 hr. or by cattle later than 108 hr. after ingestion, but under normal feeding conditions most of the living sclerotia were excreted within 48 hr. Subnormal food consumption retarded their evacuation but did not prolong their viability. Sclerotia immersed in the fluid contents of the sheep rumen were still viable at 48 hr. A pepsin digestive solution reduced but did not entirely prevent germination within this period. Surface sterilization with $HgCl_2$ reduced the germination of weakened, but did not affect that of sound, sclerotia.

Evidently cattle and sheep may introduce into uninfested fields sufficient inoculum to produce serious losses in future plantings.

Host specialization of Uromyces trifolii, E. B. MAINS (*Mich. Acad. Sci., Arts, and Letters, Papers, 21 (1936), pp. 129–134*).—The results of similar studies by others are briefly reviewed. The author's studies, continued since 1923, made use of strains of *U. trifolii* from *Trifolium pratense*, *T. Hybridum*, and *T. repens* tested on 33 species of *Trifolium*.

From the data tabulated and discussed, it is believed evident that considerable variation in reaction exists within a number of *Trifolium* species. This will make it difficult to compare the results of various workers unless the same strains of each species are used. Judging from the results obtained with other rusts, "it would not be surprising to find differences in pathogenicity within the rusts occurring on red, alsike, and white clover."

[Solanum demissum], R. N. SALAMAN (*Roy. Soc. [London], Proc., Ser. B, 121 (1936), No. 820, p. 72*).—*S. demissum* is reported as endowed with specific mechanisms of a Mendelian character against *Synchitrium endobioticum* and *Phytophthora infestans*.

[Phytopathological studies by the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 9, 10, 15*).—Progress reports are given on the control of bacterial wilt and winter-killing of alfalfa and on studies of the virus-induced peach mosaic.

[Plant disease papers from Puerto Rico] (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 3, pp. 681–[819], pls. 2*).—This number is devoted to

plant disease papers as follows: Records of Virus Diseases of Plants in Puerto Rico, by M. T. Cook (pp. 681–684), the annotated records given being arranged by families and species; Phloem Necrosis in the Stripe Disease of Corn, by Cook (pp. 685–688), in which the author describes and illustrates the phloem necrosis found in cases of a white stripe disease of corn on the station farm; Descriptions of Virus Diseases of Plants: Criticisms and Suggestions, by Cook (pp. 689, 690), a critique of the nomenclature often used in virus work, with the added suggestions that scientific names of both host and insect vector (if any) be given and that reprints carry full citation data; First Supplement to the Host Index of Virus Diseases of Plants, by Cook (pp. 691–727), which follows the procedure used in the original host index (E. S. R., 74, p. 498) and includes errata; First Supplement to the Index of Vectors of Virus Diseases of Plants, by Cook (pp. 729–739), which is supplementary to the index previously noted (E. S. R., 74, p. 499) and includes errata; and Second Supplement to Partial Bibliography of Virus Diseases of Plants, by J. I. Otero and Cook (pp. 741–[819]), which in addition to the supplementary bibliography, with subject and author indexes, contains errata to the first supplement (E. S. R., 74, p. 498).

[Phytopathological studies by the Texas Station] (*Texas Sta. Rpt. 1935, pp. 80–104, 136, 174–178, 188, 216, 248, 252–254, 267, 268*).—Progress reports are given on the following subjects of study by J. J. Taubenhaus, W. N. Ezekiel, G. E. Altstatt, J. F. Fudge, H. E. Rea, C. H. McDowell, L. E. Brooks, H. P. Smith, L. B. Loring, H. F. Morris, G. T. Boyd, R. H. Wyche, J. N. Roney, P. Decker, M. F. Kernkamp, G. M. Watkins, C. H. Rogers, and W. J. Bach: Cotton root rot disease (including the vegetative stage of *Phymatotrichum omnivorum* occurring on roots at various depths, persistence of the root rot fungus in its resting or sclerotial stage, depth of sclerotium formation in the field, inoculation experiment with *Ozonium auricomum* and *P. omnivorum*, variation within *P. omnivorum*, effects of various environmental factors of the root rot fungus, further study on the nature of immunity of monocotyledonous plants to *Phymatotrichum* root rot, growth of *P. omnivorum* in decoctions from cotton roots in various stages of *Fusarium* wilt, and the effect of other organisms on growth of *P. omnivorum*) and its control (including tests of cotton from X-rayed seed at the Iowa Park and Temple Substations, the resistance of certain rootstocks of grapes to *Phymatotrichum* root rot, control by rotation with sorghum, gramineous crop barriers and sulfur slabs to prevent the spread of *Phymatotrichum* root rot, the possible usefulness of certain volatile chemicals as fungicides against root rot—pentachlorethane, tetrachlorethane, and xylol—organic mercury compared with copper sulfate, and attempted control by soil heating); tomato diseases (including seed treatment for damping-off, stem canker, spotted wilt, *Sclerotium* rot, ink spot disease, a new fruit rot due to a *Myrothecium*) and their control (including selection for *Fusarium* wilt resistance and the toxicity of volatile materials to sclerotia of *Sclerotium rolfsii*); rose diseases (including *Diplodia* die-back, field control of die-back and black spot, effect of certain chemicals on defoliation, a *Physalospora* die-back, crown canker, and chlorosis control in roses and yaupons); sorghum diseases (including *Diplodia* blight and the micro-organisms found on moldy sorghum and other feeds); rice diseases (including black kernel, smut, and *Sclerotium* stem blight of rice and the weed *Tragia urens*); fungicidal properties of sulfur and Cuprocide (including laboratory tests, soil application of sulfur for the control of scab of potatoes, sweetpotato diseases, and strawberry chlorosis, control of oat rust by sulfur dusting, control of *Cercospora* leaf spot of beets by fungicides, effect of sulfur or Cuprocide on the yield and on the control of foliage diseases of cotton, and the effect of sulfuric acid on the germina-

tion of cotton seed); southern blight of various plants (including soil rot of watermelons, watermelon seed carriers of *Sclerotium rolfsii*, and blights of tung oil seedlings, larkspur, coreopsis, and Spanish iris); *Armillaria mellea* root rot of rhubarb and of privet; diseases of miscellaneous plants (including a live oak disease yielding the fungus *Trabutia erythrospora*, *Fusarium* stem and root blight of conifer seedlings, control of conifer blight, twig canker of elder, leaf spot of redbud, stem blight of fig, crown gall of cotton, garlic diseases, chlorosis of eggplant, bacterial wilt of popcorn, anthracnose of stock, petal spot of marigold, pink mold of Shasta daisies, fasciation in rose and collard plants); and the planting of delinted and Ceresan-treated cotton seed. Plant diseases not previously reported from Texas are listed.

Progress reports are also given of cotton root rot investigations in cooperation with the U. S. D. A. Bureau of Plant Industry at Temple Substation (including the distribution of root rot in upland and alluvial soils, a study of root rot in selected areas, moisture conditions, severity of root rot, rate of spread and viability of sclerotia in upland and alluvial soils, soil environment in root rot and disease-free areas, sclerotia from a native meadow, viability of sclerotia, clean fallow studies, effect of continuous sorghum on root rot, sclerotial studies in rotation and continuous cotton, and the effects of certain chemical elements on fungus and host); of studies of wheat diseases at Denton Substation (including leaf and stem rusts, lose smut, and bunt); of selection of tomato strains resistant to *Fusarium* wilt and southern blight at Nacogdoches Substation; of spraying tests for carrot blight at Weslaco Substation; of cotton root rot investigations at Weslaco Substation (including grape and citrus rootstock resistance tests, resistance of winter and summer legumes and of ornamentals to root rot, the effect of injections on the occurrence of root rot, and root rot on other crops); and of root rot studies at Iowa Park Substation (including sorghum as a root rot remover, cotton from X-rayed seed, and grape resistance studies).

Reports on research for 1935, G. M. Reed (*Brooklyn Bot. Gard. Rec., 25 (1936), No. 2, pp. 45–59*).—Progress reports are given on the influence of the growth of the host (oats) on smut development, physiologic races of the oat smuts, the inheritance of resistance of oat hybrids to loose and covered smuts, studies on the cultural characteristics of the oat smuts by L. G. Utter, and the sorghum smut investigations by D. E. Marcy.

Studies on the adhesiveness of sulfur residues on foliage, R. P. White (*New Jersey Stas. Bul. 611 (1936), pp. 21, figs. 18*).—The data presented are believed to indicate that the ability of sulfur suspensions to wet foliage is, in general, correlated with the surface tension of the continuous phase of the suspensoid, except on certain types of leaves, as those of beets and snapdragons. The only available explanation for the increased wetting properties of filtrates from such colloidal materials as commercial flour and proteinaceous substances on such foliage is that the soluble portions have a chemical attraction for the cuticle. Amendments with low surface tension seemed to wet these leaves, but the film broke readily, leaving large areas uncovered. The film deposited by filtrates from the proteinaceous materials did not break in this way, but thoroughly wet the waxy cuticle, although the surface tension was much higher. Certain other discrepancies from the generality that the wetting properties of a spray are directly correlated with surface tension are also brought out. These variations indicate that the chemical relationship between the leaf cuticle and the continuous phase of the suspensoid may be the determining factor for wetting by certain sprays on certain types of foliage.

The total deposit of the discontinuous phase of suspensoids of equal concentrations depends on the surface tension and wetting abilities of the spray.

Suspensoids with low surface tension or high wettability spread over the sprayed surface in a thin film and additional spray runs off, leaving a minimum of the discontinuous phase after drying. Conversely, suspensoids with high surface tension or low wettability may fail to wet the foliage at all. The suspensoids of sulfur used in this study were of variable surface tension. The sulfur deposit with the best of wetting agents was considered sufficient for disease control.

A certain amount of the original deposit is mechanically lost with the first precipitation after drying, and the greater the original deposit the greater will be the total mechanical loss, due to the loss of the larger sulfur particles. With larger deposits, however, a greater number of colloidal particles will be deposited, resulting in greater sulfur residues. Less mechanical loss follows from the originally smaller deposits. Following the original mechanical loss, subsequent losses are independent of precipitation and are correlated directly with time.

Lime-sulfur (1-49) deposited on rose foliage a greater amount of sulfur and retained more after mechanical loss than did flotation sulfur, precipitated sulfur, or bentonite sulfur. The original sulfur deposit was further increased by the addition of a proprietary wettable sulfur. A greatly increased deposit may be obtained with sulfur dusts, but the mechanical losses are also greatly increased.

The type of foliage sprayed has a direct influence on the original deposit and on the residue, but apparently has but little to do with subsequent losses.

Inhibition of arsenic injury to plants by phosphorus, A. M. Hurd-Karrer (*Jour. Wash. Acad. Sci., 26 (1936), No. 4, pp. 180, 181*).—From the results of tests with wheat in culture solutions, supplemented by field tests, it is believed that phosphate applications will reduce or prevent arsenic injury to plants where the soil type is such as to retain the phosphate in available form.

Preliminary results indicate a corresponding relation between rubidium and potassium.

On the decomposition of copper-lime spray complexes [trans. title], P. Reckendorfer (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 9, pp. 418–438*).—This is an analytical contribution to the knowledge of the "water-soluble" coppers.

Formaldehyde for seed and soil treatment: A bibliography (*Wilmington, Del.: E. I. du Pont de Nemours & Co., R. & H. Chem. Dept., 1936, pp. [1]+55*).—This is an annotated bibliography.

Vinegar as a soil disinfectant, W. L. Doran (*Science, 84 (1936), No. 2177, pp. 273, 274*).—Investigations with 13 species of ornamentals and with beets at the Massachusetts Experiment Station indicated that an acetic acid dust (about 23 percent acetic acid in powdered wood charcoal) is as effective against *Pythium* and *Rhizoctonia* damping-off of seedlings, and as safe, as formaldehyde-containing dust, when mixed well with sandy soil at the rate of 42 g per square foot of area with the seeds sown and the soil well watered immediately after this treatment. Ordinary cider vinegar (from 4 to 5 percent acetic acid) applied at the rate of from 200 to 250 cc per square foot was also found reasonably effective against some of the damping-off fungi and relatively or quite harmless to 10 species of flowering ornamentals and to beets, cabbage, lettuce, and tomato.

The effect of latent infection on the smut-resistant Markton oat, H. Stevens (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 711–713*).—The results of this study by the U. S. D. A. Bureau of Plant Industry in cooperation with the Idaho Experiment Station indicated that this resistant variety is injured by inoculation and infection with smuts (*Ustilago levis*, with some contamination

by *U. avenae*) that cause the killing of many seeds and thus reduce the stands. However, after the seedlings emerge and become established there appear to be no detrimental effects. Furthermore, under field conditions practically no inoculum would be produced in a resistant variety to infect the following crop spontaneously.

Black chaff, a composite disease, W. A. F. HAGBORG (*Canad. Jour. Res., 14 (1936), No. 9, Sect. C, pp. 347–359, pl. 1*).—Three distinct types of blackening were found. One was due to *Phytomonas translucens undulosum* [=*Bacterium translucens undulosum*], a second consistently yielded *Alternaria*, and a third (internodal melanism) appeared to be physiological in origin. *P. atrofaciens* [*B. atrofaciens*] was occasionally found in black chaff lesions.

Seed or seedling inoculations, without wounding, and soil inoculations proved ineffective for testing the pathogenicity of bacterial isolates. A successful method, involving a minimum of mechanical injury to the tissues, was developed for flooding the mesophyll of wheat leaves with a bacterial suspension.

Reaction of wheat varieties to composites of races of bunt occurring in the Pacific Northwest, J. F. MARTIN (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 672–682*).—In this study by the U. S. D. A. Bureau of Plant Industry and the Oregon Experiment Station, 250 wheat varieties, including common, club, durum, emmer, poulard, Polish, and wheat × rye, were tested in 1934 at Pendleton, Oreg., for resistance to a local and a Northwest composite of bunt collections differing distinctly in pathogenicity. A Hussar × Hohenheimer selection proved most resistant, while Oro, Yogo, Ashkof, and Ridit were the most resistant varieties among the hard red winter wheats commercially grown in the United States. Several other varieties were highly resistant to the local composite. Ruby and Garnet proved to be the most resistant of the commercial hard red spring and Berkeley Rock and Odessa of the soft red winter varieties. None of the commercial varieties of white wheat were highly resistant. Albit and Hymar were the only commercial club wheats not highly susceptible to all collections used. Golden Ball and Marouani were more resistant than the other durum varieties.

The hard red winter and durum wheats were more resistant than the other wheat classes, but resistant varieties created exceptions within each class. The largest number of highly resistant varieties occurred in the hard red winter and soft red winter groups. The tendency for late tillers to be bunted was noted in the durum and in other moderately resistant wheats.

Influence of environmental factors on immunity of wheat, I. A. STEFANOVSKIJ (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 2 (1936), No. 8, pp. 341–345*).—The sowing of wheat at different dates established the fact that with late sowing the incidence of brown rust (*Puccinia triticina*) was sharply increased among the varieties used. Under irrigation, the varieties of durum wheats from Mediterranean and neighboring countries proved most immune. With early sowing of vernalized seed, some varieties showed a fall, others a rise, in incidence of rust. With late sowing of vernalized seed a rise in rust incidence usually followed, owing to the lack of uniformity in the development of plants from vernalized v. control seed.

The spore load of market wheat, O. SCHNELLHARDT and F. D. HEALD (*Amer. Micros. Soc. Trans., 55 (1936), No. 3, pp. 281–285, figs. 2*).—This contribution by the Washington Experiment Station describes a device for measuring the spore load of market wheat. In the samples tested the number varied from a few to 2,771 per grain (exclusive of bunt), fungi of 8 genera being obtained. *Cladosporium malorum* occurred most frequently, but preliminary tests failed to establish its pathogenicity for wheat.

The question of resistance of bush bean varieties to Pseudomonas medicaginis phaseolicola, the cause of halo blight [trans. title], C. STAPP and H. HÄHNE (*Angew. Bot., 18 (1936), No. 3, pp. 249–262*).—The authors report varietal resistance tests of seeds of 56 varieties from 360 sources in the greenhouse and similar tests with seeds from 476 sources in the field.

Halo blight of beans: Varietal resistance tests, A. T. PUGSLEY (*Jour. Dept. Agr. Victoria, 34 (1936), No. 6, pp. 311–315, figs. 2*).—The varietal resistance tests against *Phytomonas medicaginis phaseolicola* [=*Bacterium medicaginis phaseolicola*], here recorded, led to the general conclusion that with the usual care in seed selection planting of any of the resistant varieties mentioned will give satisfactory control of the disease.

Halo blight of beans: Control by resistant varieties, S. FISH and A. T. PUGSLEY (*Jour. Dept. Agr. Victoria, 34 (1936), No. 6, p. 278*).—Lists are given of very resistant, moderately resistant, and susceptible varieties of beans.

[Researches on the yellowing and mosaic diseases of beets] (*Inst. Belge Amélior. Betterave Pubs., 4 (1936). No. 2, pp. 23–33; Fr., Dutch, Ger., Eng. abs., pp. 32, 33; pp. 35–60, figs. 7; Fr., Dutch, Ger., Eng. abs., pp. 58–60*).—These two papers, the first by H. W. Quanjer and the second by G. Roland, give general summaries of the literature of these two diseases and of the studies on them carried out at the Laboratory for Mycology and Potato Research at Wageningen, Netherlands.

A preliminary note on the control of internal browning of cauliflower by the use of boron, C. H. DEARBORN and G. J. RALEIGH (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 622, 623*).—At the end of one season's tests by Cornell University, in which 6 minor elements were applied on separate rows in 22 fields representing all the important soil types of the area affected, internal and surface browning had occurred in all plats except those fertilized with boron.

A study of meteorological factors governing the multiplication of Rhizoctonia solani on the cotton plant [trans. title], R. L. STEYAERT (*Inst. Natl. Étude Agron. Congo Belge Pubs., Sér. Sci., No. 7 (1936), pp. 27, figs. 3*).—A survey of the literature indicated infection by *R. solani* to be strongly influenced by soil temperature, the lower temperatures favoring its development but also the germination of the seed. In the Belgian Congo exposure to the sun plays a preponderant role in the development of the disease. A feeble exposure favors *R. solani* and at the same time stimulates the germinating power of the seed.

Fungicidal treatments of the seed showed but little in the way of results, but control by the use of resistant varieties gives promise. The Triumph variety, now acclimated, shows considerable resistance. It is believed, however, that control in this region should be based especially on the choice of soil and appropriate cultural practices, including the sowing of leguminous cover crops.

Cotton seed disinfection experiments to control bacterial diseases of the cotton plant, T. LAYCOCK (*Nigeria Agr. Dept. Bul., 11 (1936), pp. 22–30*).—Tests over several seasons, using sulfuric acid, Germisan, and Germisan plus soap, led to the conclusion that "external disinfection of cottonseed, by checking the development of bacterial diseases, is an economic and practical measure."

Basal disease and root rot of lupine (cause, Rhizoctonia solani) [trans. title], H. RICHTER (*Zentbl. Bakt. [etc.], 2. Abt., 94 (1936), No. 5–8, pp. 127–133, figs. 8*).—The author describes the disease and reports its experimental production. Cross-infection tests between lupines and potatoes indicated clearly that the fungus forms biological races. He believes *Moniliopsis aderholdi* to be identical with *R. solani*.

Ecological basis of protecting measures against bacteriosis of cucumbers in hotbeds, K. Ia. Kalashnikov (*Inst. Zashch. Rast., Zashch. Rast. (Lenin Acad. Agr. Sci. U. S. S. R., Inst. Plant Protect., Plant Protect.), No. 8 (1935), pp. 55–59; Eng. abs., p. 59*).—The principal measures employed in the prevention of infection with *Bacterium lachrymans* [=*Phytomonas lachrymans*] lay in keeping the temperature high (from 25° to 34° C.), preventing droplets of water from remaining on the plants for any length of time, and avoidance of cultivation.

Antagonism in fungi as a measure of control in "red-leg" disease of lettuce, R. P. Asthana (*Indian Acad. Sci. Proc., 4 (1936), No. 3, Sect. B, pp. 201–207*).—Of the 14 fungi tested, *Penicillium chrysogenum*, *Eidamia viridescens*, *Trichoderma lignorum*, and *Phoma* sp. (especially the last two) proved the most active in their repressive effects on the germination, growth, and parasitic action of *Botrytis cinerea*. The same effects were produced by culture filtrates of these fungi.

Spotted wilt of garden pea, O. C. Whipple (*Phytopathology, 26 (1936), No. 9, pp. 918–920, fig. 1*).—That a disease of the streak type occurring on *Pisum sativum* under glass and in the field in Wisconsin is due to the virus of spotted wilt was demonstrated at the University of Wisconsin by transfer to a variety of hosts using thrips as a vector or employing the rubbing method. Known facts indicate that the disease may be widespread on peas in the United States and elsewhere. The symptoms are described and illustrated.

Destruction of potato haulm to prevent blight infection of the tubers, D. H. Findlay and E. T. Sykes (*Jour. Min. Agr. [Gt. Brit.], 43 (1936), No. 5, pp. 457–459*).—Spraying the potato plants about 3 weeks before harvesting time with 12.5 percent H_2SO_4 or with 5 percent $CuSO_4$ proved effective in killing the haulm and reducing the blight infection of the tubers. The killing of the haulm was more rapid and complete with the H_2SO_4. A test with $CuSO_4$ dust (followed by rain) was also effective.

A study of the aucuba or yellow mosaics of the potato, P. E. M. Clinch, J. B. Loughnane, and P. A. Murphy (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1936), No. 41, pp. 431–448, pls. 3*).—"A comparative account is given of the symptoms and properties of the virus of aucuba mosaic of potato, a virus isolated out of interveinal mosaic of potato and referred to as the tuber blotch virus, and a latent virus in the Dutch variety Monocraat supplied by Professor Quanjer. The three viruses are readily transmissible by sap to potato and a number of other solanaceous plants."

A comparison of some Dutch and Irish potato mosaic viruses, P. A. Murphy and J. B. Loughnane (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1936), No. 40, pp. 419–430, pl. 1*).—"Examination of Dutch potato mosaic diseases, carried out in conjunction with similar work in America, showed the presence of viruses X, B, Y, A, F, and vein-banding virus, occurring alone and in combinations. Symptoms in some cases were absent (X, Y, and F) and in others corresponded to those of simple mosaic (X), veinal mosaic (Y or A), rugose mosaic or leaf drop (X+Y), crinkle (X+A), and interveinal mosaic (X+F). These viruses and diseases are the same as those common in Ireland, and probably in N. W. Europe generally, but others are important in continental areas. Other viruses were found which were similar to A or Y but not identical. It is concluded that Y and A are distinct from each other, but that each may be the type of a smaller group of closely related or practically identical viruses analogous to the X viruses. Virus Y caused pronounced veinal mosaic on *Solanum nodiflorum* on which A produced no symptoms. This plant also differentiated the viruses related to A and Y, as well as virus F, and proved a useful new differential host."

An abnormal graft reaction in potato resulting from a virus infection of a scion on a resistant stock, W. P. RALEIGH (*Phytopathology, 26 (1936), No. 8, pp. 795, 796, fig. 1*).—Scions with latent mosaic developed aerial tubers, leaf rolling, and stunting when grafted on healthy seedlings known to be resistant. Similar results followed with mild mosaic scions on Irish Cobbler stock known to be somewhat resistant, but here the rate of development of the aerial tubers was slower than in the first case. It appears that this method may prove valuable in studies of resistance to viroses.

A further contribution to the degeneration problem in potatoes [trans. title], F. BERKNER (*Pflanzenbau, 12 (1936), No. 7, pp. 243–274*).—Following a brief review of the literature, the author summarizes his studies of recent years having to do with the influence of the soil, the anions and cations of nutrient salts, and the climate on potato degeneration and on the production of sound seed tubers. The results lead him to favor the ecological theory of the origin of degeneration, and he concludes that to produce sound seed all ecological factors which may induce metabolic disturbances must, so far as possible, be eliminated. The points which are considered most important for seed potato production are summarized.

Michigan potato diseases and their control, J. H. MUNCIE (*Mich. State Col. Ext. Bul. 162, rev. (1936), pp. 60, figs. 42*).—A well-illustrated popular treatise.

Reaction of sorghums to the root, crown, and shoot rot of milo, F. A. WAGNER (*Jour. Amer. Soc. Agron., 28 (1936), No. 8, pp. 643–654, figs. 4*).—In this contribution by the Kansas Experiment Station, the disease studied is described and reported as occurring in Kansas, Texas, New Mexico, and possibly also in California and Oklahoma. The rot is due primarily to *Pythium arrhenomanes*. It was not controlled by any of the usual cultivation or rotation methods or by changes in planting time. Milo, most milo derivatives, and darso proved very susceptible, while kafirs, feteritas, and most sorgos were highly resistant. The sorghum varieties, selections, and crosses tested on infested soil are listed and described as highly susceptible, resistant, immune, or segregating, as the case may be.

The disease was controlled by the use of resistant varieties or resistant strains of susceptible varieties. Resistant strains have been selected of Dwarf Yellow milo, Wheatland, and Beaver, and seed will soon be available.

The ultracentrifugal crystallization of tobacco mosaic virus protein, R. W. G. WYCKOFF and R. B. COREY (*Science, 84 (1936), No. 2188, p. 513*).—A crystalline protein containing all but a fraction of one percent of the virus initially present was obtained directly by ultracentrifuging at 25,000 r. p. m. the juice of plants infected with tobacco mosaic. The X-ray patterns of this crystalline material and of the protein prepared from the juice by chemical means were indistinguishable, indicating that the two substances were substantially identical.

Inactivation of tobacco-mosaic virus by X-rays, J. W. GOWEN and W. C. PRICE (*Science, 84 (1936), No. 2189, pp. 536, 537, fig. 1*).—Virus extracted from diseased Turkish tobacco, adjusted to about pH 7 by Na_2HPO_4, filtered through celite and a Berkefeld "N" filter, and allowed to dry for 18 hr. or more, was exposed to X-rays (K radiation, 1.537 a. u.) 5.0 cm from the copper target for different lengths of time. Tests with the treated virus inoculated into bean leaves showed that survival of the virus followed a simple curve, which suggests that the absorption of a single unit of energy in a virus particle is sufficient to cause inactivation of the particle. This suggests an alteration in the virus particles comparable to that which takes place in genes subjected to X-radiation.

A new disease of tobacco, possibly of the virus type, E. F. S. SHEPHERD (*Mauritius Dept. Agr. Leaflet 40 (1936), pp.* [7], *fig. 1*).—The author describes a disease shown to be infectious and from which no micro-organisms were obtained, characterized by mosaicked leaves with the dark-green areas bulged upward and with green swellings on the under surfaces associated with the veins. Later these swellings assumed the form of leafy outgrowths.

Injury to greenhouse tomatoes as a result of a combined infection with the viruses causing tomato and cucumber mosaic, S. P. DOOLITTLE and L. J. ALEXANDER (*Phytopathology, 26 (1936), No. 9, pp. 920–923, figs. 2*).—Greenhouse tomatoes in Colorado and Ohio were severely damaged by a virosis with symptoms unlike those of ordinary tomato mosaic, the plants being abnormally short and compact, with bushy, upright, often peculiarly greenish-purple leaves, and the young leaflets being thick with a pronounced vein yellowing. Blossoms were commonly malformed and abortive, and the few fruits produced were deeply ridged. Experiments, cooperative between the U. S. Department of Agriculture and the Ohio Experiment Station, indicated that the new trouble was due to ordinary tomato mosaic (tobacco virus 1, Johnson) combined with cucumber mosaic (cucumber virus 1, Doolittle). Aphids were thought to have introduced the cucumber virus from nearby field muskmelons in Ohio and from greenhouse cucumbers in Colorado.

Tomato mildew causes asthma, E. F. GUBA (*Florists Exch. and Hort. Trade World, 86 (1936), No. 17, p. 20*).—This is a contribution by the Massachusetts Experiment Station.

[**Diseases of sugarcane**] (*Internatl. Soc. Sugar Cane Technol. Cong. [Brisbane] Proc., 5 (1935), pp. 87–105, 108–116, 118–120, 199–203, 205–209, 484–492, 494–497, 498–505, 507–517, 519–521, 707–710, 712–722, 723–729, 730–736, 736–739, 799–803, 804–811, 812–822, 823–828, [pls. 11], figs. [5]*).—Papers on plant diseases presented at the Fifth Congress of the International Society of Sugar Cane Technologists held in Brisbane, Australia, August 27 to September 3, 1935, included Importance of the Virus Diseases of Sugar Cane, by E. W. Brandes and J. Matz (pp. 87–105); On the Future of Research on the Virus Diseases of Plants, by H. H. Storey (pp. 108–116); The Insect Vectors of Virus Diseases of Sugar Cane, by C. E. Pemberton (pp. 118–120); Two Inoculation Methods, by A. F. Bell (pp. 199, 200); Progress of Sugar-Cane Root Rot Studies in Hawaii, by C. W. Carpenter (pp. 201–203); Sugar-Cane Disease Control in Hawaii Through the Modification of Agricultural Practices, by J. P. Martin (pp. 205–209); Disease Resistance Tests on Sugar-Cane Seedlings and Initial Selection Procedure in the Southern United States, by R. D. Rands, E. V. Abbott, and E. M. Summers (pp. 484–492); Testing Canes for Disease Resistance in Louisiana, by C. W. Edgerton and E. C. Tims (La.) (pp. 494–497); Fiji Disease and Varieties, by D. S. North and E. G. Baber (pp. 498–505); Gumming and Leaf Scald Resistance Trials in Mauritius, by E. F. S. Shepherd (pp. 507–511); Disease Resistance Trials in Queensland, by A. F. Bell (pp. 511–517); Testing Cane Varieties for Disease Resistance in Hawaii, by J. P. Martin and C. W. Carpenter (pp. 519–521); The Hawaiian System of Sugar-Cane Quarantine, by H. P. Agee (pp. 707–710); The Variability of Plant Pathogens, by W. Cottrell-Dormer (pp. 712–722); Strains of the Sugar-Cane Mosaic Virus in Louisiana, by E. M. Summers (pp. 723–729); Physiologic Specialization in *Colletotrichum falcatum* Went, by E. V. Abbott (pp. 730–736); Gummosis Disease of Sugar Cane in Puerto Rico, by M. T. Cook (pp. 736–739); Relative Infectivity of Mosaic Virus in the Different Parts of Infected Sugar-Cane, by J. Matz (pp. 799–803); Transmission of New Types of Sugar-Cane Mosaic and Some Observations on Significance of the Diseases, by E. W. Brandes (pp. 804–811); Streak

Disease of Sugar Cane, by A. P. D. McClean (pp. 812–822); and Chlorotic Streak Disease of Sugar Cane, by J. P. Martin (pp. 823–828).

Little-leaf or rosette of fruit trees.—V, Effect of zinc on the growth of plants of various types in controlled soil and water culture experiments, D. R. HOAGLAND, W. H. CHANDLER, and P. L. HIBBARD (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 131–141, figs. 9*).—Continuing these studies by the University of California (E. S. R., 75, p. 709), "a disease prevented by the addition of zinc to the culture medium was produced under controlled conditions (1) in a subsoil from a little leaf orchard; (2) in water culture when zinc was not added to the nutrient solution. The symptoms of disease, resembling those of little leaf in a number of species, developed on apricot, tobacco, squash, corn, mustard, tomato, sunflower, cotton. Alfalfa was much less susceptible to the unfavorable soil or solution conditions than the plants named above. Commercial dried sheep manure was markedly effective in preventing injury to plants, with exception of corn, grown in the toxic soil. The action of the manure cannot be explained at present merely on the basis of zinc content. The relation of the results to the cause of little leaf disease and to future lines of inquiry is discussed."

Spray materials and the control of apple scab and cedar rust, J. M. HAMILTON (*Conn. Pomol. Soc. Proc., 45 (1935), pp. 218–223*).—This contribution by the New York State Experiment Station is an address discussing control measures for these two apple diseases, with special reference to spray materials and schedules and based on investigations in the Hudson Valley.

Experiments with dilute and modified sprays for prevention of apple scab, I. P. LEWIS (*Midwest Fruitman, 10 (1936), No. 2–3, pp. 7, 9*).—Tests reported by the Ohio Experiment Station indicate that, if applied thoroughly and at the right time, comparatively mild strengths of lime-sulfur give satisfactory control, together with better foliage and fruit of finer finish. Formulas for different varieties are given.

Non-parasitic diseases of the apple in storage, H. H. PLAGGE, T. J. MANEY, and B. S. PICKETT (*Conn. Pomol. Soc. Proc., 45 (1935), pp. 205–216, figs. 2*).—This contribution by the Iowa Experiment Station briefly summarizes the data on this group of apple storage diseases, which have been under special study by the station for the past 12 yr. The diseases included are mealy break-down, soggy break-down, brown heart, Jonathan spot, scald, water core, bitter pit, and other diseases sometimes confused with those above named. Storage temperatures are recommended, as based on the experimental data accumulated and confirmed by the work of other investigators.

Black-end of pears, III, L. D. DAVIS and W. P. TUFTS; **IV, pH of Bartlett pear fruits,** L. D. DAVIS and N. P. MOORE (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 304–322, figs. 8*).—Previous studies at the University of California had indicated that the disease was more prevalent on certain rootstocks (E. S. R., 60, p. 143), and that individual trees producing black end fruit, scattered seemingly at random in orchards, usually continued to do so (E. S. R., 68, p. 211). The results are presented of certain field observations and experiments designed to develop a complete case history of the trouble or to effect its cure. Thus far no satisfactory explanation of the exact cause has been found, but the disease presents an example of some rather unusual rootstock effects in which the fruit is markedly affected and the tree little, if any at all. The black end producing possibilities of individual stocks seem to vary continuously among any seedling population and to maintain their relative rank from year to year. Various possibilities as to causal relations are discussed, one illustrative case suggested being the possibility that the disease is due to

failure of the *Pyrus serotina* rootstock to absorb sufficient materials from the soil (such as water) to care properly for the developing fruit.

Certain aspects of the problem suggested that a determination of the oxidation-reduction potential in black end v. normal fruits would be of value, and a necessary preliminary to this phase of the study was a determination of possible pH differences. However, the data presented "only indicate that there is a relationship between the H-ion concentration of the juice of the fruit and the presence of black end. These differences extend into the sections of the fruit that are not visibly affected by the disease. . . . They do not indicate whether the differences are a cause, a result, or simply an accompanying condition."

The menace of cherry mosaic, W. Newton (*Better Fruit, 31 (1936), No. 3, pp. 7, 14, figs. 2*).—A highly infectious leaf mottling of sweet cherry [*Prunus avium*] found in one tree in a British Columbia orchard proved readily transmissible to healthy trees by budding, pruning, and rubbing the leaves with juice from diseased foliage. The spread was from 3 to 4 ft. in about a month.

Heat treatments for the cure of yellows and other virus diseases of peach, L. O. Kunkel (*Phytopathology, 26 (1936), No. 9, pp. 809–830, figs. 4*).—Peach yellows disease was cured in from 2 to 4 weeks by keeping potted trees in a warm room varying from 34.4° to 36.3° C. (approximately 94° to 98° F.). Cured trees assumed a normal habit of growth and produced healthy appearing stems and leaves. It took longer to cure large than small trees. The virus was destroyed more quickly in small than in large stems and in tops than in roots imbedded in moist soil. Intermittent treatments were ineffective. Dormant trees were cured without serious injury by immersing them for about 10 min. in water at 50° C. (122° F.). Yellows virus in buds was inactivated in from 4 to 5 days by immersing bud sticks at 34.35°, in 11 hr. at 38°, in 40 min. at 42°, in 15 min. at 46°, in from 3 to 4 min. at 50°, and in 15 sec. at 56°. The bud tissues endured much longer treatments. Little peach and red suture were also cured by treatments effective with yellows, but rosette, though cured by heat, proved somewhat more refractory.

Progress report of the "X" disease of peach, E. M. Stoddard (*Conn. Pomol. Soc. Proc., 45 (1935), pp. 25–27*).—This contribution by the Connecticut [New Haven] Experiment Station reports progress in studies of this apparently new disease, which reached noticeable proportions in the State in 1933 and has now been located in 66 percent of the orchards in the northern half, with as high as 100 percent infection in some cases. The symptoms are described, and observations on the spread of the disease are given. Successful transmission by budding was noted whether or not the buds grew. Zinc sulfate treatments gave no very definite results, but cutting off of affected branches was apparently beneficial. The author is inclined to the virus theory of causation.

A root infection of plums (*New Jersey Stas. Nursery Disease Notes, 9 (1936), No. 1, pp. 4*).—The root trouble reported was found to be associated with *Valsa leucostoma*.

The use of bordeaux spray on cranberry bogs in relation to the control of fruit rots and to vine growth and productivity, H. F. Bergman (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 65 (1935), pp. 11–15, 18–22, figs. 3*).—Early rots caused the major part of the spoilage of berries from unsprayed plats in a majority of the bogs investigated during the 1932–33 seasons, *Glomerella*, *Sporonema*, and *Diaporthe* being the most important causes. The damage from any given fungus varied independently of that from any other, and the June reflows increased greatly the amount of spoilage.

Spraying proved beneficial in all the bogs where tried. In many cases two bordeaux treatments apparently gave as good control of rots as three, and two

mercurial sprays used on one bog in 1932 were fully as effective as the bordeaux spray. *Sporonema* was controlled most effectively and the other two least.

The amount of copper (Cu) in the cranberry bog soils varied in almost direct proportion to the amount of organic matter, in which most of it occurred. The largest amount in soils of heavily sprayed bogs was about 0.15 percent of the dry weight, while soils of unsprayed bogs contained from 0.001 to 0.0025 percent on the same basis. Most of the Cu in the bog soils was insoluble in water. The amount in vines from heavily sprayed bogs was from 0.05 to 0.1 mg per gram of their dry weight, while in unsprayed vines it was from 0.005 to 0.04 mg. The amount absorbed by vines grown in M 64,000 $CuSO_4$ solutions was less than 0.5 mg per gram of dry weight, and it exceeded 1.5 mg only in vines grown in solutions at M 4,000 or over. Cranberry plants were not killed after growing in M 2,000 $CuSO_4$ solutions for about 2½ mo., those grown in M 64,000 solutions made almost or quite as much growth as the controls, and the application of 2,000 lb. of $CuSO_4$ to the soil per acre caused no injury to the vines.

There is no evidence that spraying with bordeaux mixture has caused, or is likely to cause, injury to cranberries.

Root rots of the raspberry, G. H. BERKELEY (*Canad. Jour. Res., 14 (1936), No. 8, Sect. C, pp. 306–317, pls. 4*).—*Coniothyrium fuckelii, Cylindrocarpon radicicola, Fusarium* sp., *Cylindrocladium* sp., *Pythium* spp., and *Rhizoctonia* spp. were isolated from naturally infected roots, and each was proved capable of causing necrotic lesions. In addition, the "phycomycetous mycorrhizal" fungus already associated with root rot of strawberries and tobacco was almost always observed in the roots of affected raspberries and, to a lesser extent, also in apparently healthy plants. Nematodes were present in and on roots from certain soils. Strawberry and raspberry seeds sown in sterilized soil developed healthy roots, while those sown in nonsterilized affected soil developed necrotic lesions.

Not only are some of the symptoms of raspberry and strawberry root rot similar, but also many of the fungi and nematodes generally conceded to be associated with root rots in strawberry are found in root rots of raspberry. The unthriftiness of certain British Columbia raspberry plantations is possibly related to these conditions.

Susceptibility of grape rootstocks to root knot nematode, E. SNYDER (*U. S. Dept. Agr. Circ. 405 (1936), pp. 16, figs. 9*).—In tests of 5 plants each of 154 varieties of *Vitis vinifera* on heavily infested soil, all proved very susceptible to infestation with *Heterodera marioni* and the majority of the American species and hybrids included in the tests were too seriously affected to be considered as nematode-resistant stocks. None of the stock varieties were immune, but certain grape species, notably *V. doaniana, V. champini, V. longii,* and *V. cinerea,* gave evidence of some inherent resistance. The stock varieties and their hybrids which appeared sufficiently resistant to merit commercial trials included Barnes, De Grassett, and Dog Ridge of *V. champini;* Salt Creek of *V. doaniana;* and the two *V. longii* hybrids Solonis × Othello, No. 1613, and Solonis × *V. riparia,* No. 1616. On account of their vigor and general adaptability, Dog Ridge, Salt Creek, and Solonis × Othello, No. 1613, have been selected for further trials.

Experiments on the treatment of mottle-leaf of citrus trees, II, E. R. PARKER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 82–86*).—Continuing the experiments (E. S. R., 74, p. 661) involving the testing of zinc sulfate (alone and with lime) sprays under a wide range of conditions in California, including selected orchards near Riverside, improvement in the foliage of affected

citrus trees was obtained in all trials. It thus appears that zinc is a specific remedy for mottle-leaf. Details are given regarding the concentration of zinc sulfate-lime sprays, the influence of time of application, the rate of application, and the value of spreaders and stickers. The results of spraying or dusting with various other zinc-containing materials are also reported, none used having failed to give an initial response to trees affected with mottle-leaf. Zinc oxide is believed to offer promise for combination with insecticides.

Perfect stage of the sweet orange fruit scab fungus, A. A. Bitancourt and A. E. Jenkins (*Mycologia, 28 (1936), No. 5, pp. 489–492, figs. 2*).—*Elsinoe australis* n. sp. is described and illustrated as the perfect stage of *Sphaceloma australis* n. comb. (=*S. fawcettii viscosa*).

Stem end rot in early citrus fruit, W. J. Bach (*Tex. Farming and Citric., 13 (1936), No. 3, pp. 4, 19*).—This disease first assumed serious proportions in Texas during 1930. In these studies by the Texas Experiment Station a relation was found between the occurrence of stem-end rot and the presence of deadwood in the trees, which harbors the fungus parasites (*Diplodia*, except for a *Phomopsis* in one case). The main infection in the State came from the *Diplodia* living over in twig blight. At 50° F. or lower the fungi were held in check, but high temperatures accounted for the greater abundance of the rot during the warm weather of early fall and late spring. Entrance is usually gained through the stem. Losses may be appalling, as shown by the accompanying tables.

The most important factors for control in the tests outlined were pruning and dipping the fruit in borax solution (8 percent being recommended). Sodium metaborate also gave promising results, and it has the advantage of being soluble in cold water. The interval between picking and cooling below 55° should be shortened as much as possible for best results.

The relation of pest control treatment to water rot of navel oranges, W. Ebeling and L. J. Klotz (*Calif. Dept. Agr. Bul., 25 (1936), No. 3, pp. 360–368, figs. 2*).—Data on the causes, symptoms, and some contributing factors have been previously noted (E. S. R., 69, p. 540). In this contribution from the California Citrus Experiment Station, the authors present the results of a survey of the water rot situation in 1936 and of laboratory tests. In these tests, wherein the fruits were given various pest control treatments and kept for varying periods in a rain chamber, the same differences were found in the susceptibility under different control measures as in the field survey. The greater susceptibility of sprayed fruits to water rot, as compared to the fumigated or untreated, was not associated with any specific effect of the oil, but may have been related to a general softening and weakening of the tissues.

A preliminary report on Diplodia die-back of roses, J. J. Taubenhaus and G. T. Boyd (*Amer. Rose Ann., 1936, pp. 127–129*).—This contribution by the Texas Experiment Station describes the symptoms of the disease and records successful inoculations with pure cultures of *Diplodia* from various sources, survival of the fungus for 13 mo. in dry storage, and promise of control by weekly removal of unopened bloom buds followed by dusting with a mixture of sulfur, monohydrated $CuSO_4$, and paris green (9–1–1).

Flower color in "broken" or mosaic tulips, L. E. Longley (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 674–677*).—These inoculation studies by the Minnesota Experiment Station were made to determine the effects of the disease on flower coloration and to ascertain the varietal susceptibility to the virus. Of some 80 varieties tested, 39 gave definite evidence of infection. The symptoms are described in detail, and a flower-color classification is given for the varieties artificially infected.

Chlorosis of pin oaks, L. C. Chadwick (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 669–673*).—The data obtained in this study by Ohio State University

apparently indicate that this chlorosis can be overcome by soil treatments with ferrous sulfate, but the nature of the tests does not warrant a statement as to the effectiveness of this salt alone. It is deemed probable that sulfur created a favorable reaction inducive to ready absorption of the iron. Early spring applications to the soil of ferrous sulfate plus sulfur are recommended as a practical control measure.

Progressive effects of Polyporus versicolor on the physical and chemical properties of red gum sapwood, T. C. Scheffer (*U. S. Dept. Agr., Tech. Bul. 527 (1936), pp. 46, pls. 2, figs. 15*).—Most prominent in the attack on the microscopic structure of *Liquidambar styraciflua* was a uniform thinning of the cell walls, indicating the action of enzymes capable of affecting the wood substance ahead of the hyphae. The walls were perforated principally through the pit membranes. The characteristic bleaching effect was due to a destruction of semisoluble pigments and not dependent on a consumption of lignin. The rapid depletion of chromogenic materials appeared to be accounted for by a consumption of the original water extractives. No apparent changes in the dimensions of the wet wood or in the shrinkage of the decayed specimens were found.

The incidence of specific gravity reduction appeared to have been delayed between 8 and 10 days after inoculation, after which weight losses were largely proportionate to the incubation time. All the strength properties tested, except those indicated by modulus of elasticity, fiber stress at proportional limit, and work to proportional limit were initially lowered more rapidly than the specific gravity. These three tests were relatively tardy in responding to the decay. Beyond the initial stages all the strength properties were reduced more rapidly than specific gravity. Values of all the strength properties approached zero considerably before the point of complete wood consumption. All the strength properties considered were mostly lower than those of sound wood of the same specific gravity. It is suggested that the initial reduction in strength was due to the removal or alteration of relatively small amounts of cell-wall lignin and soluble carbohydrates which had served to cement the fundamental cellulose together.

As indicators of incipient decay, work to maximum load and total work beyond maximum load were outstanding. For indicating extent of decay, modulus of rupture and maximum crushing strength appeared most dependable. The equilibrium moisture content of decayed wood was slightly lowered. Decayed wood was somewhat more responsive to atmospheric changes in moisture than sound wood, decidedly susceptible to changes in liquid water, and much more capable of maintaining a substantially higher moisture content when intermittently exposed to liquid water.

The most important effects of the decay on chemical composition were the following: The relative proportions of the principal wood constituents were not materially altered; the lignin, pentosans not in cellulose, cold-water-soluble and 1-percent alkali-soluble components were first attacked, while the Cross and Bevan cellulose, pentosans in cellulose, and strictly hot-water-soluble portions were but little affected until part of the wood substance had been consumed; in the early stages the depletion of cellulose was represented by losses in both the stable and unstable forms; in the later stages the consumption of stable cellulose was more pronounced; and losses in calorific value were directly proportional to the accompanying losses in wood substance.

New host plants of Heterodera schachtii.—IV, Supplement to race studies on H. schachtii [trans. title], H. Goffart (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 8, pp. 359–364*).—The author reports 13 new hosts as new to science and 2 as new to Europe.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the Chief of the Bureau of Biological Survey, 1936, I. N. GABRIELSON (*U. S. Dept. Agr., Bur. Biol. Survey Rpt., 1936, pp. 68*).—The work of the year reported upon (E. S. R., 74, p. 809) includes data on the status and distribution of wildlife, including waterfowl and investigations of buffalo, musk ox, and other wildlife in Alaska, and biological surveys of refuge areas; economic investigations of wildlife, including eelgrass and other waterfowl food, water caltrop as a pest plant, effects of mosquito control, food habits of wildlife, and depredations by predators; fur-production research, including the further decrease in fur animals, fur-farming developments, rabbit-fur studies, cooperative research work in embryology with coyotes, and work at the Fur Animal Experiment Station at Saratoga Springs, N. Y., with minks, foxes, and martens and at the Rabbit Experiment Station at Fontana, Calif., on farming, breeding, and feeding; research in disease control, including distemper, quail diseases, and development of a nonpoisonous shot for wild-fowling; migratory waterfowl restoration; wildlife refuges; baits for rats in pineapple fields; and miscellaneous administrative data.

Game management on the farm, J. N. DARLING, H. P. SHELDON, and I. N. GABRIELSON (*U. S. Dept. Agr., Farmers' Bul. 1759 (1936), pp II+22, figs. 14*).—A practical account with illustrations from drawings by the senior author.

Fluctuations in numbers of ruffed grouse, Bonasa umbellus (Linne), with special reference to Ontario, C. H. D. CLARKE (*Univ. Toronto Studies, Biol. Ser., No. 41 (1936), pp. 118, figs. 15*).—Following a brief introduction and historical sketch, the subject is dealt with under the headings of materials and methods, population studies, life history observations, climax and dying-off, parasites and diseases, other causes of mortality, and influence of man on grouse numbers. The work is presented with a list of 217 references.

In order to trace the occurrence of parasites and diseases in ruffed grouse and other grouse, 200 specimens were examined, of which 162 were ruffed grouse. A total of 17 species of animal parasites, including 1 spirochete, 3 protozoa, 7 helminths, 3 Acarina, and 3 insects, were found in ruffed grouse. The occurrence of mycosis is also recorded. Cultures and inoculations failed to reveal any pathogenic bacteria. A number of pathological conditions were found traceable to old wounds. The only organism found to be significantly associated with the cyclic diminution and compatible with its characteristics was a blood protozoon, *Leucocytozoon bonasae*.

The cause of the periodicity in the recurrence of the diminution in grouse numbers is discussed. Meteorological and astronomical conditions, such as sunspots, are not considered to be the cause. Some characteristics of the disease due to *L. bonasae* are suggested as possibly responsible.

Studies on the heterophyid trematode Apophallus venustus (Ransom 1920) in Canada.—I, Morphology and taxonomy, T. W. M. CAMERON (*Canad. Jour. Res., 14 (1936), No. 6, Sect. D, pp. 59–69, pl. 1, figs. 3*).—The minute intestinal trematode *A. venustus* here considered is said to occur in the cat, dog, raccoon, and heron in the lower Ottawa Valley.

Trypanosoma neotomae sp. nov. in the dusky-footed wood rat and the wood rat flea, F. D. WOOD (*Calif. Univ. Pubs. Zool., 41 (1936), No. 11, pp. 133–143, pl. 1*).—*T. neotomae* here described as new, which in size, behavior, and morphology resembles *T. lewisi* of the Norway rat, has been found by the author in the blood of 12 out of 62 Portola wood rats (*Neotoma fuscipes annectens* Elliott) and 1 out of 78 San Diego wood rats (*N. fuscipes macrotis* Thomas) collected in California. Its development in the wood rat flea, *Orchopeas wickhami wickhami* Baker, was found to be similar to that of *T. lewisi* in the rat flea.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1172–1176*).—Contributions presented (E. S. R., 76, p. 357) are Cerambycids Captured in Codling Moth Bait Traps, by S. A. Summerland and J. M. Amos (pp. 1172, 1173); Bill-Posters' Paste in Mite Control [*Tetranychus bimaculatus* Harvey] Sprays, by R. Hutson (p. 1173); Control of Potato Flea Beetle (*Epitrix cucumeris* Harr.), by F. A. Herman and J. F. Hockey (pp. 1173, 1174); Calcium Cyanide for Control of Squash Bug (*Anasa tristis* De G.), by J. B. Moore (p. 1174), contributed from New York State Experiment Station; Methyl Bromide Fumigation of Codling Moth Larvae, by D. L. Lindgren (pp. 1174, 1175), contributed from the California Citrus Experiment Station; *Amelia* (*Tortrix*) *pallorana* Robinson Attacks *Pinus* sp. (p. 1175) and *Leptocoris trivittatus* Say Killed by a Sulfonated Higher Alcohol Spray (p. 1176), both by E. I. McDaniel; Method of Rearing Corn Earworm Larvae, by G. W. Barber (pp. 1175, 1176); and Lesser Wax Moth [*Achroia grisella* Fab.] Found in Oregon and California, by G. H. Vansell (p. 1176).

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, E–384, pp. 257; E–385, pp. 3, pls. 3; E–386, pp. 8; E–387, pp. 4; E–388, pp. 4; E–389, pp. 4; E–390, pp. 3; E–391, pp. 2*).—Further contributions in this series (E. S. R., 75, p. 655) are A Bibliography of Nicotine—I, Chemistry of Nicotine, by R. L. Busbey and N. E. McIndoo (E–384); The Construction and Use of Light Traps Designed to Catch the Asiatic Garden Beetle [*Autoserica castanea* Arr.], by I. M. Hawley (E–385); The Control of Grape Insects and Diseases, by B. A. Porter and J. B. Demaree (E–386); Control of House Ants (E–387); Screw Worm Control, by W. E. Dove (E–388); Clothes Moths (E–389); Cockroaches (E–390); and Benzol an Efficient Screw Worm Killer (E–391).

[Contributions on economic entomology] (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 155–161, 201–213, 213–223*).—These contributions have been noted under the same title from another source (E. S. R., 76, p. 64).

[Work in economic entomology by the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 24–29*).—Reference is made to the work of the year in economic entomology (E. S. R., 75, p. 224) as follows: Pyrethrum dusts for control of the cabbage looper, the alfalfa looper, and the diamondback moth on cabbage and cauliflower; insect vectors of peach mosaic; tomato psyllid in relation to potatoes and to tomatoes; and general insect pests, including the common red spider, pine-leaf scale (officially known as the pine-needle scale), the European earwig, and the codling moth larva parasite *Ascogaster carpocapsae*.

Insects of Indiana for 1935, J. J. Davis (*Ind. Acad. Sci. Proc., 51 (1935), pp. 257–268, figs. 2*).—The occurrence of the more important field crop, vegetable, fruit, small fruit, shade tree and ornamental shrub, flower garden, household, and miscellaneous insects in 1935 is considered in this contribution from the Indiana Experiment Station (E. S. R., 74, p. 366). A discussion of the honeybee situation, by J. E. Starkey, State apiary inspector of Indiana, is included (p. 268).

[Contributions on economic insects] (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 20 (1935), pp. 203–215, 258–260, 261–263*).—Contributions presented include the following: Codling Moth and Its Control, by H. N. Worthley (pp. 203–209); The Codling Moth in 1935 and 1936, by E. N. Cory (pp. 209–212); Present Status of the Rosy Apple Aphid and Its Control, by W. S. Hough (pp. 212–215); and The Bee Louse (pp. 258–260) and Spinach Insects (pp. 261–263), both by E. N. Cory.

[Work in economic entomology by the Texas Station] (*Texas Sta. Rpt. 1935, pp. 42–53, 129–132, 135, 241–243, 251, 252*).—The work of the year reported upon (E. S. R., 75, p. 78) includes that with the sorghum webworm, by H. J.

Reinhard; bollweevil hibernation, in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, by Reinhard, R. W. Moreland, and S. E. Jones; cotton flea hopper, including varietal resistance by F. L. Thomas and F. F. Bibby, strip planting and control by Bibby, migration and population by J. C. Gaines, and hibernation by Reinhard (a report relating to which by Thomas has been noted (E. S. R., 75, p. 516)); pink bollworm, in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, by A. J. Chapman, W. L. Owen, Jr., et al. (E. S. R., 75, p. 230); cotton bollworm, in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, by R. K. Fletcher and Moreland; thrips on cotton (principally the flower thrips), by Gaines and Thomas; sulfur as an insecticide, by Thomas et al.; pecan insect investigations, by S. W. Bilsing; studies on devil's shoestring (*Cracca virginiana*) as an insecticide, in cooperation with the Texas A. & M. College and the U. S. D. A. Bureau of Plant Industry, by V. A. Little and G. A. Russell; the turnip aphid, by J. N. Roney; several cabbageworms, by Roney, S. W. Clark, and Jones; the onion thrips, by Jones; apiary inspection, 1934–35, by C. E. Heard; apiculture, including the activities of bees, by H. B. Parks, adaptability of native plants, queen rearing, and bee production, all by Parks and A. H. Alex, and the relationship of honey plants to insects, by Parks; at the Temple Substation the cotton flea hopper and miscellaneous disease and insect pests, by C. H. Rogers and H. E. Rea; at the Sonora Substation insects affecting animals, in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, including the sheep botfly in the head of sheep, screwworms (*Chrysomyia americana* and the screwworm), the effect of arsenic pentoxide on bait, goat lice, and the winter tick, all by O. G. Babcock; and at the Weslaco Substation citrus mites and spiders, by Clark and Thomas, and control of the cabbage aphid with rotenone and the root knot nematode with cyanamide, both by Clark.

Report of the entomologist for the year 1935, A. Pickles (*Trinidad and Tobago Dept. Agr. Rpt., 1935, pp. 50, 51*).—Brief reference is made to the occurrence of and work of the year with economic insects.

[Parasite investigations]: A summary of investigations made in 1935, W. B. Gurney (*Agr. Gaz. N. S. Wales, 47 (1936), Nos. 7, pp. 374–378, figs. 5; 8, pp. 453–456, 464, 472, figs. 4*).—A summary of fruitfly parasite investigations made in India in 1935 (pp. 374–378) and an account of white wax scale (*Ceroplastes destructor* and *C. ceriferus*) parasite collection, chiefly in east Africa (pp. 453–456, 464, 472) are presented.

Observations on the pupal respiration of some insects of economic importance, F. A. Squire (*Bul. Ent. Res., 27 (1936), No. 3, pp. 381–384, figs. 2*).—Evidence obtained by the author from dissections supports the view that the periods of greatest physiological activity, as indicated by the rate of respiration, occur at the beginning and at the end of the prepupal-pupal instar. It appears that with *Brassolis sophorae* the most marked changes occur during the prepupa and the first to third days of the pupal instar and again on the ninth to the twelfth days.

Additional notes on little-known cotton insects, J. W. Folsom (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1066–1068*).—The observations here recorded, made at Tallulah, La., in 1935, supplement those previously noted (E. S. R., 75, p. 518).

Annotated list of insects injurious to cotton in Tanganyika, W. V. Harris (*Bul. Ent. Res., 27 (1936), No. 3, pp. 523–528*).—An annotated list of the insect enemies of cotton in Tanganyika, arranged according to the part of the plant injured, is presented.

Insect pests of muck crops, G. E. GOULD (*Indiana Sta. Circ. 221 (1936), pp. 20, figs. 14*).—A practical account of the more important insect pests of muck crops, including cabbage and related crops, celery, cucumbers, melon, squash, mint, potatoes, and onions.

The relation of cover crops to insects on citrus, J. R. WATSON (*Citrus Indus., 17 (1936), No. 6, pp. 12, 13*).—A contribution from the Florida Experiment Station.

Handy insect cages made from cellophane, E. M. SEARLS and H. H. HARRIS (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1158–1160, figs. 4*).—This is a contribution from the Wisconsin Experiment Station.

Studies of contact insecticides.—XI, Further determinations of the penetration of arsenic into insects, W. C. O'KANE and L. C. GLOVER (*New Hampshire Sta. Tech. Bul. 65 (1936), pp. 8, figs. 5*).—The present paper gives the results of a further study of the penetration of arsenic (E. S. R., 74, p. 231). The American cockroach was treated with anhydrous arsenious oxide and with sodium arsenite. Application was made by sealing a beeswax cell containing the toxicant to the dorsal metathorax. Subsequently entire roaches as well as parts and tissues were studied by means of the Gutzeit method to determine the amount of arsenic present. Experiments were conducted to determine the effects brought about by providing increased areas for penetration and by varying the amounts of the toxicant present.

"The amounts of arsenic recovered from the bodies of cockroaches treated with anhydrous arsenious oxide were as follows: 72 hr., 0.010 mg/g body weight; 120 hr., 0.025 mg/g; 168 hr., 0.021 mg/g. When cockroaches were treated with sodium arsenite the amounts recovered were: 72 hr., 0.073 mg/g body weight; 120 hr., 0.103 mg/g; 168 hr., 0.162 mg/g. Increasing the area over which the toxicant is in contact with the integument results in increased amounts found in the tissues. The amount of dry toxicant placed in the cell has no significant influence on the amount of arsenic recovered, provided the area at the bottom of the cell is covered. Sodium arsenite penetrates the integument more rapidly than does arsenious oxide. In the case of arsenious oxide, cockroaches after a certain period may be able to eliminate arsenic from certain tissues as fast as it enters the body. Arsenic is eliminated to a considerable extent by way of the digestive tract. When rather high concentrations are built up in the body of the roach, arsenic may be recovered in all parts and tissues. Parts and tissues nearest the application cell may contain the largest amounts of arsenic."

Pilosity of the cotton plant in relation to adherence of dusted calcium arsenate, E. W. DUNNAM (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1085–1087, fig. 1*).—It was found in 1935 at Stoneville, Miss., in work with two varieties of cotton, that "the smooth variety when dusted wet retained more poison than the hairy variety when dusted dry. When dust applications were made on dry plants, the percentage retained, as calculated on the basis of the wet applications, remained greater for the hairy variety than for the smooth. The percentage of adherence for the smooth variety under both dates of sampling, as calculated on the basis of the hairy variety, was significantly greater when plants were dusted wet. These data offer strong evidence that pilosity is an important factor in the adherence of calcium arsenate. This character is more important when plants are dusted dry."

Toxicity of certain stomach poisons to several common lepidopterous larvae, T. R. HANSBERRY and C. H. RICHARDSON (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1160–1166*).—A modification of Campbell's method (E. S. R., 62, p. 648; 63, p. 749) of feeding measurable doses of poison to leaf-feeding insects is described in this contribution from the Iowa Experiment Station. The authors

report 23 determinations for lepidopterous larvae and compile 60 more from the literature. From these data comparisons of toxicity of a poison for different insects and different poisons for the same insect are made. For larvae of the silkworm, several organic toxicants including rotenone and some of its derivatives, nitrophenols, and certain of the coal-tar dyes are most toxic. Following these are lead arsenate and many of the common fluorine insecticides. In the least toxic group are various arsenicals and organic and inorganic compounds. Lead arsenate used against various larvae gives minimal lethal doses ranging from about 0.05 mg per gram of body weight for 3 species of *Datana* to 0.25 and 0.26 mg for the corn earworm and armyworm. The observations and comparisons made indicate a rather specific action of many poisons for various lepidopterous larvae.

Relation of viscosity to drop size and the application of oils by atomization, E. M. Searls and F. M. Snyder (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1167–1170*).—The findings at the Wisconsin Experiment Station demonstrate that the atomizer used in these tests was quite ineffective in applying oils throughout a wide range of viscosities. The nozzle of the machine was designed for the application of oils of low viscosities and quite incapable of self-adjustment to oils of higher viscosities. It is also indicated that if a cattle spray is to be applied effectively, an atomizer must be used which is either adjusted to the particular viscosity of the spray in question or is capable of effectively applying oils of a wide range of viscosities. These data, combined with observations made during the study, indicate that an atomizer must produce a spray having an $\frac{S \times N}{T}$ value of at least 0.03 to be effective.

Thiodiphenolamine, a new ingredient of mosquito larvicides, G. A. Mail (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1144–1146*).—Preliminary observations at the Montana Experiment Station indicate that the addition of thiodiphenolamine to a mosquito oil may, by increasing its toxicity, enable economies to be made in the quantities of oil necessary to cover a given area without the sacrifice of efficiency.

Vacuum fumigation, D. L. Lindgren (*Jour. Econ. Ent., 29 (1936), No. 6, pp 1132–1137*).—The results of a study of atmospheric, dissipated vacuum and sustained vacuum fumigation, conducted at the California Citrus Experiment Station with a view to determining the relative value of each, are reported. It was found that, in an empty fumatorium where penetration of the fumigant is not a factor, atmospheric fumigation is almost as efficient as dissipated vacuum, but neither is as effective as sustained vacuum fumigation. When penetration of the fumigant into soil, burlap sacking, etc., is required, sustained vacuum fumigation is much more effective than either atmospheric or dissipated vacuum fumigation. The difference between dissipated vacuum and atmospheric fumigation is not so great. A higher concentration is required to penetrate moist soil than dry soil. When both adsorption and penetration to some extent have to be considered, the difference between atmospheric, dissipated vacuum and sustained vacuum fumigation is not so great as when penetration is the only factor to be considered.

A contribution to the knowledge of the Mallophaga of the mammals of South America [trans. title], F. L. Werneck (*Mem. Inst. Oswaldo Cruz, 31 (1936), No. 3, pp. 391–590, pl. 1, figs. 227*).—This contribution presents the synonymy, hosts, distribution so far as known, and descriptions of the bird lice of South America, accompanied by tables to the families (4 in number) and genera of the forms recognized from South America, also to the 24 recognized forms of *Trichodectes*. Four species are described as new.

Parasitizing European earwig with Bigonicheta setipennis Fall.: Recent developments in methods and equipment, C. W. Getzendaner (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1105–1114, figs. 7*).—The technic employed in work with *B. setipennis*, an initial stock of which was sent from Europe to Puyallup, Wash., in 1931, is reported upon. A description is given of the traps and methods used in collecting the European earwig as host material for this parasite, as well as of mating and oviposition cages for the parasite. Methods of handling the flies during their emergence, mating, and preoviposition and oviposition periods are summarized. Equipment and methods are described for inducing oviposition, anesthetizing, parasitizing, and caring for the earwigs and recovery of parasite puparia by means of a rotary sifter. A parasite trap for field recovery is delineated to obviate much collecting and rearing.

Experimental studies on locomotor activity in Locusta migratoria migratorioides, R. and F., K. H. L. Key (*Bul. Ent. Res., 27 (1936), No. 3, pp. 399–422, figs. 6*).—The author has devised a technic for determining quantitatively the "spontaneous" locomotor activity of hoppers of *L. migratoria migratorioides* in terms of the distance traveled in half an hour in a special activity cage in which temperature, light intensity, and humidity could be accurately controlled and all stimulation avoided. He reports upon its application.

The oriental migratory locust (Locusta migratoria manilensis Meyen) and the Bombay locust (Patanga succincta L.) in Malaya, G. H. Corbett and N. C. E. Miller (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 18 (1936), pp. [4]+15, pls. 3, fig. 1*).—An account is given of the recorded appearances of the oriental migratory locust and the Bombay locust in Malaya.

Report of proceedings of the Inter-State Locust Conference, Pretoria, 1934 (*Pietermaritzburg: Natal Witness, Ltd., 1935, pp. 116, pls. 15*).—This report of the proceedings of a locust conference held at Pretoria from July 30 to August 3, 1934, presents reports on the administration and policy concerning recent outbreaks and invasions and the combative measures undertaken (pp. 10-46), scientific locust research with particular reference to methods of destruction (pp. 46-103), probable extent of 1934-35 invasions and outbreaks south of the Equator (pp. 103-106), interstate cooperation (pp. 106-110), and plans for dealing with future outbreaks and invasions by the territories concerned (pp. 110, 111).

Secular trends of locust outbreaks in the Philippines and their apparent relation with sunspot cycles, L. B. Uichanco (*Philippine Agr., 25 (1936), No. 4, pp. 321–356, figs. 13*).—A chronology of locust outbreaks in the Philippines, dating from the earliest written account in 1569 to 1934, is first presented. The discussion which follows considers the intervals of outbreak cycles; the correlation between sunspot cycles and locust outbreaks; sunspots, climatic features, and locusts; and some practical considerations. It is concluded that the average relatively locust-free interval between outbreaks in the 365 yr. under review is 11 yr., and that this probably nearly represents the master cycle in the locust periodicity in the Philippines. "There appears to be a fairly marked negative correlation between solar activity and locust fluctuation. The coefficient of correlation between sunspot area in millionths of visible solar hemisphere and annual maximum number of municipalities infested is -0.44 ± 0.111. This relationship would serve to explain the close correspondence between the probable master cycle of locust outbreaks and the 11-yr. average interval between sunspot minima."

A four-page list of references is included.

Fly parasites of grasshoppers, N. S. Noble (*Agr. Gaz. N. S. Wales, 47 (1936), No. 7, pp. 383–385, figs. 5*).—A brief account of the parasitic enemies of grasshoppers in New South Wales.

***Observations on life history of lily bulb thrips Liothrips vaneeckei* Priesner**, R. Schopp (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1099–1103, figs. 2*).—Studies of the biology of *L. vaneeckei*, conducted under laboratory and field conditions at Sumner, Wash., are reported upon. It was found that in the natural development of the lily bulb thrips as determined by a study of the proportions of stages in natural population samples taken at regular intervals, there are two groups progressing from the two predominant overwintering stages. An alternation of the overwintering stage in each group is indicated, one developing from overwintering adults entering the following winter principally as second-instar larvae, and the other developing from overwintering second-instar larvae entering the following winter principally as adults. Life history data obtained under laboratory conditions differed considerably from those obtained in the field studies, which indicated that the laboratory conditions did not accurately represent the field conditions.

***California Christmas berry thrips Rhynchothrips ilex* (Moulton)**, S. F. Bailey (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1114–1117, fig. 1*).—Observations of the biology of *R. ilex*, which is found normally and reproduces so far as known on only the one host *Photinia arbutifolia* in California, where it is widely used as an ornamental shrub, are reported upon. Severe infestations may render the host unsightly.

Effect of several varieties of sorghum and other host plants on biology of the chinch bug, R. G. Dahms, R. O. Snelling, and F. A. Fenton (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1147–1153, figs. 2*).—The progress of work conducted by the U. S. D. A. Bureaus of Entomology and Plant Quarantine and Plant Industry (E. S. R., 75, p. 378), in cooperation with the Oklahoma Experiment Station, is reported upon.

"When female chinch bugs were confined with seedlings of several varieties of sorghum and other host plants, they deposited the most eggs on Dwarf Yellow milo sorghum and the next greatest number on Manchuria barley. Then in order came Blackhull kafir, Hays Golden corn, Kanota oats, Sudan grass, Turkey wheat, Atlas sorgo, and common feterita. Approximately the same number of eggs were deposited in cages with oats and Sudan grass seedlings. No eggs were laid in the cages with feterita plants. The greatest number of eggs were deposited by females confined with tender shoots from Johnson grass plants. There was a marked variation in the longevity of females when confined with these different food plants, and this was not always correlated with the total number of eggs laid. Bugs of both generations lived longest on Johnson grass. Then, in order, for the first generation, came Hays Golden corn, Manchuria barley, Dwarf Yellow milo, Blackhull kafir, Kanota oats, Sudan grass, Turkey wheat, Atlas sorgo, and feterita; and for the second generation, Dwarf Yellow milo, Manchuria barley, Hays Golden corn, Blackhull kafir, Sudan grass, Kanota oats, Turkey wheat, feterita, and Atlas sorgo. In both generations the last two were practically the same in their influence on longevity. Chinch bug nymphs reared on Dwarf Yellow milo, a susceptible variety under field conditions, developed more rapidly and were larger and more vigorous than those reared on Atlas sorgo, a resistant variety. Adult chinch bugs under laboratory conditions showed a preference for susceptible varieties over resistant varieties. The resistant variety Atlas sorgo showed greater tolerance to a uniform infestation of adult chinch bugs than any of the other varieties tested."

Experiments with oil sprays to control rhododendron whitefly, R. Latta (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1125–1128*).—The discovery of well established infestations of the rhododendron white fly *Dialeurodes chittendeni* Laing. on private estates in the Puget Sound area of Washington in 1933 led to the control experiments here reported. Sprays containing 2 percent oil produced a high mortality of all the larval stages and the pupae and are considered sufficient for commercial control. In infestations where complete control is to be attempted the strength of oil should be increased to not less than 4 percent. No unfavorable plant reaction resulted from these applications.

The citrus whitefly, S. W. Clark (*Tex. Citric. and Farming, 13 (1936), No. 2, p. 17*).—This contribution from the Texas Experiment Station relates to the citrus white fly in the lower Rio Grande Valley, where it is becoming increasingly important.

Biology of the mealy plum aphid (*Hyalopterus pruni* (Geoffroy)), L. M. Smith (*Hilgardia [California Sta.], 10 (1936), No. 7, pp. 167–211, pl. 1, figs. 12*).—A historical review of the taxonomy of the mealy plum aphid is followed by information on its geographical distribution, terminology, and morphology. Its life history and yearly cycle in California is then dealt with at some length, followed by reports upon its host plants and its parasites and predators. It is pointed out that this pest is widely distributed in the world, having been reported from 27 countries and from 15 States in the United States.

"The stages in the annual cycle are egg, fundatrix, fundatrigenia, migrans, alienicola, gynopara, alate male, and oviparous female. Each instar of these forms is described. Minute differences exist between the two alate stages, *migrantes* (named *H. pruni* by Fabricius) and gynoparae (named *H. arundinis* by Fabricius). The hatching period is about 2 weeks in length. The seasonal occurrence of each form is given. Migrantes cannot survive on plum after the fourth molt, and do not serve to distribute the aphids from tree to tree. They can survive only on the secondary hosts. Distribution of this species in the orchards is achieved only in the fall during the return flight of the gynoparae. Each migration may cover 30 miles, which makes possible natural spread at the rate of 60 miles a year. The percentage of males on the secondary hosts increases throughout the fall and approximates 100 percent late in November. Each gynopara produces an average of 9.8 oviparous females. Oviparous females deposit an average of 3.3 eggs each.

"The primary hosts of the mealy plum aphid in California consist only of varieties of *Prunus domestica* Linn. The secondary host in Placer County is the cattail (*Typha latifolia* Linn.); in San Joaquin County the secondary host is the common reed *Phragmites communis* Trin. Many hosts cited in the literature have been tested experimentally and found not to be acceptable to the plum aphid.

"Numerous species of parasites and predators attack the plum aphid. Syrphid larvae predominate in Placer County, coccinellids and *Leucopis* in San Joaquin County."

A list is given of 64 references to the literature.

Aphids, W. A. Price (*Kentucky Sta. Circ. 45 (1936), pp. 8, figs. 4*).—A brief practical account of aphids and means for their control.

Notes on intermountain aphids, G. F. Knowlton and C. F. Smith (*Ent. News, 47 (1936), No. 8, pp. 210–213, fig. 1*).—The notes here presented on aphids infesting range and forest plants in Utah and Idaho, contributed from the Utah Experiment Station, include one form taken from the rose described as new under the name *Bipersona hottesi*.

Effect of ground derris upon pea aphid when infesting peas subsequent to spraying, T. E. Bronson (*Jour. Econ. Ent.*, *29* (*1936*), *No. 6, pp. 1170–1172*).—Field tests of ground derris with spreaders and wetting agents used as a spray against the pea aphid during the 1935 season at Madison, Wis., briefly reported upon, resulted in excellent control of this aphid and apparent temporary protection of the pea plants from subsequent infestation, as reported in a previous contribution (E. S. R., 75, p. 664).

A series of greenhouse tests was conducted during the winter of 1935 in which pea plants were sprayed and later infested with aphids in an effort to determine whether derris sprays have a protective effect on pea foliage. The results indicate that derris spray containing either of the two spreaders and wetting agents used protects potted pea plants artificially infested with the pea aphid for a period of 7 days against any building up of the original infestation of the pea aphid.

Further studies on cotton-root aphid and other subterranean aphids in South Atlantic States, C. F. Rainwater (*Jour. Econ. Ent.*, *29* (*1936*), *No. 6, pp. 1092–1095, fig. 1*).—Work conducted by the U. S. D. A. Bureau of Entomology and Plant Quarantine in 1935, the South Carolina Experiment Station cooperating, in continuation of that for 1934 previously noted (E. S. R., 74, p. 233), is reported upon. The distribution of cotton root aphids (the corn root aphid, *Trifidaphis phaseoli* (Pass.), and *Rhopalosiphum* sp.) in the South Atlantic States is shown by a map. Observations of the relation of temperature to life history of *Rhopalosiphum* sp. and the relation of subterranean aphids to host plants in the vicinity of Florence, S. C., are detailed in tables.

New butterfly record for United States (Lepid.: Nymphalidae), E. T. Cresson, Jr. (*Ent. News*, *47* (*1936*), *No. 2, pp. 52–55*).—Contributing from the Minnesota Experiment Station record is made of the collection of *Erebia discoidalis* Kby. in the Itasca State Park in northern Minnesota.

Structural differences between greater and lesser wax moth, W. P. Hayes (*Jour. Econ. Ent.*, *29* (*1936*), *No. 6, pp. 1055–1058, figs. 10*).—The adult, larval, and pupal differences in the wax moth and lesser wax moth are considered.

Omnivorous leaf tier, Cnephasia longana Haw.: A relatively new pest of strawberries, iris, and other crops in Oregon, W. D. Edwards and D. C. Mote (*Jour. Econ. Ent.*, *29* (*1936*), *No. 6, pp. 1118–1123*).—A study by the Oregon Experiment Station of the tortricid moth *C. longana* (officially known as the strawberry fruitworm), a European pest first found in the United States in 1929 in Oregon tunneling into strawberries and later in Dutch bulbous iris, is reported upon. Its known host plants are distributed in 12 plant families and constitute 29 common plants. Typical injury to several economic host plants, including the strawberry, Dutch iris, flax, pea, wheat, hop, filbert, clover, vetch, alfalfa, and wild flowers, is described. Five species of insect parasites have been recorded as attacking it, namely, *Phytodietus burgessi* Cress., *Glypta* sp., *Diocles eureka* Ashm., *Microbracon hyslopi* Vier., and *M. gelechiae* (Ashm.). *M. gelechiae* appears to be by far the most important in controlling the larvae. In some localities parasitism has been observed to reach approximately 20 percent, and in others no parasites have been found.

The parasites of the coffee leaf-miners (Leucoptera spp.) in Africa, C. Ferrière (*Bul. Ent. Res.*, *27* (*1936*), *No. 3, pp. 477–491, figs. 5*).—Following a general discussion of leaf miners of the genus *Leucoptera* as serious enemies of coffee wherever it is cultivated, descriptions are given of 10 new species. A review of the literature has shown that 17 species of Hymenoptera act as primary or secondary parasites of coffee leaf miners.

The control and eradication of prickly-pear in Australia, A. P. Dodd (*Bul. Ent. Res.*, *27* (*1936*), *No. 3, pp. 503–522, pls. 3*).—This is an account of the

effort to control the pricklypear pest in Australia, where 25,000,000 acres of good grazing and agricultural land, previously a wilderness of dense pricklypear, have been retrieved to such an extent that they are being developed and brought into production as a result of the activities of the Argentina moth borer *Cactoblastis cactorum* Berg. The only introduction of this insect, which is a native of Uruguay and northern Argentina, consisted of approximately 2,750 individuals forwarded as unhatched eggs from Argentina in March 1925.

Experiments with new materials to control peach borer, O. I. SNAPP and J. R. THOMSON, JR. (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1088–1092*).—The results of extensive control experiments with the emulsion of crude cottonseed oil impregnated with paradichlorobenzene for control of the peach borer in nursery stock and in orchard peach trees of all ages, conducted at Fort Valley, Ga., during the last 4 yr., are reported.

"Ethylene dichloride emulsion gave the best borer control, was the cheapest, and proved to be the safest, under the conditions in the fall of 1935, of all the materials used in the experiments dealing with orchard trees of all ages and with nursery stock before it is dug. Under the same weather and other conditions, paradichlorobenzene crystals are much more toxic to peach trees than the emulsion of crude cottonseed oil impregnated with paradichlorobenzene. On account of the danger of severe tree injury, paradichlorobenzene crystals should not be used around peach trees less than 4 yr. of age under conditions in the South. An emulsion of amylene dichlorides is very toxic to peach nursery stock and orchard trees when used at concentrations sufficient to give only fair control of the peach borer. An emulsion of mixed amyl chlorides was neither effective against the peach borer in nursery stock and orchard trees nor toxic to the trees at the same concentrations as used for the amylene dichlorides emulsion. Applications made during the period October 20–25 were more effective and in some cases safer than those made during the period October 10–15, the time now recommended for peach borer-control applications in this latitude."

Insecticide experiments on codling moth in Michigan, 1929–1935, F. SHERMAN III (*Michigan Sta. Spec. Bul. 277 (1936), pp. 18, figs. 5*).—The results of tests of various insecticides and spray practices, undertaken in 1928 following numerous complaints by apple growers of increasing codling moth damage, are reported upon, the details being given in tables and graphs. This pest was unusually abundant and injurious in orchards of the State during the 6-yr. period 1929–34, reaching the most serious proportions during the season of 1933. Climatic conditions especially favored the spring brood moths from 1929 to 1934. In 1935, when climatic conditions during June were the reverse of the preceding five seasons, codling moth injury was slight. It has been found that the flight of adult moths may be expected to occur throughout the summer season, since low temperatures seldom are limiting factors. The great variation in the lateness of moth flight in the fall is indicated, which emphasizes the need of yearly observations to determine the number of spray applications for the summer brood.

"Lead, zinc, and calcium arsenate are discussed. They rate in effectiveness in the order named. The lead arsenate-oil combination was the most effective spray, but with this treatment residue removal is greatly complicated. It is shown that fruit sprayed with lead arsenate after June 15 usually has an excess residue. The oil-nicotine sulfate combination is shown of value for certain varieties and offers an alternative to growers who cannot wash their fruit. Several materials which were tested but showed slight promise are briefly discussed."

Effect of cold storage on eggs and young larvae of codling moth, E. J. Newcomer (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1123–1125, fig. 1*).—This contribution relates to work with the codling moth, the unhatched eggs of which on harvested fruit, especially on Bartlett pears, have been a source of annoyance to fruit shippers and canners in the Northwest. During the process of ripening, the eggs hatch and fruit apparently uninfested becomes quite wormy. The observations reported have led to the conclusion that storage of the fruit from 3.5 to 4 weeks at temperatures of from 30° to 31° F. is necessary to effect a practically complete mortality of the eggs and young larvae of this moth which may be on or in the fruit. This temperature range is approximately that used in commercial practice for the storage of apples and pears.

Field methods for investigation of codling moth insecticides, J. Marshall and K. Groves (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1137–1144, figs. 2*).—This report on field methods, developed during the course of investigations of codling moth insecticides (E. S. R., 74, p. 228), is contributed from the Washington Experiment Station.

The European corn borer in New Jersey, B. B. Pepper (*New Jersey Stas. Circ. 370 (1936), pp. 15*).—The European corn borer though present in New Jersey for several years has caused but little economic damage except in localized areas in Monmouth, Ocean, and Middlesex Counties, especially during 1935. It is now spread over the entire State, the one-brooded form being found in the northwestern counties along the Delaware River, while the two-brooded form is present along the eastern part of the State from Cape May County to New York. The contribution considers its host plants, the type of injury caused, its morphology and biology, caterpillars that might be mistaken for it, and methods of control.

A summary of insects attracted to liquid baits, S. W. Frost (*Ent. News, 47 (1936), Nos. 3, pp. 64–68; 4, pp. 89–92*).—Insects taken during a course of tests with attractants for the oriental fruit moth conducted by the Pennsylvania Experiment Station in a peach orchard in Adams Co., Pa., repeated four times during the summers of 1933 and 1934, are reported upon, the results being given in table form.

Possibility of malarial outbreaks in New Jersey, T. J. Headlee (*New Jersey Stas. Circ. 368 (1936), pp. 8*).—Attention is called to the fact that during the period from 1879 to 1931, inclusive, there has been a steady decrease in the occurrence of malaria in New Jersey. While *Anopheles quadrimaculatus*, the known vector of the disease, has been found to occur all over the State where trapping has been conducted, the number caught in the area covered by mosquito control work has been well-nigh negligible. "In some trapped areas not under mosquito control, particularly in the towns and cities along the Delaware River, large populations of this mosquito have been shown to exist. In areas not under trapping the presence of this vector has also been demonstrated. The Camden County outbreak, in which there has occurred 110 or more cases of malaria, is likely to be duplicated at any point where large populations of *A. quadrimaculatus* exist and a carrier or carriers of the infection happen to be residing."

It is concluded that destruction of the mosquito vector by eliminating the breeding places is the only practical way of attacking the problem.

Pear midge in relation to fruit set and timing of control sprays, F. G. Mundinger (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1058–1063, figs. 2*).—Studies of the growth of midge-infested and uninfested Bartlett pear fruits, made by the New York State Experiment Station during the years 1931, 1932, and 1933, are reported upon, the details being given in table and chart form. It was found that midge-infested fruits in some way not well understood cause a

shedding of uninfested fruits growing in the same cluster. Where midge infestation is heavy the crop may be seriously depleted. The midges oviposit usually in the four most distal blossom buds on the peduncle. Normally, blossom buds nearest the base of the peduncle are most likely to set and mature fruits. Control sprays timed to destroy the flies before they are able to oviposit in any of the four most advanced blossom buds afford the best protection against the pear midge.

The blackflies of eastern Canada (Simuliidae, Diptera), I, II, C. R. Twinn (*Canad. Jour. Res., 14 (1936), Nos. 9, Sect. D, pp. 97–130, pl. 1, figs. 9; 10, Sect. D, pp. 131–150, figs. 6*).—Of the 23 species belonging to 3 subgenera of the family Simuliidae here recorded and described, 12 are new to science. In addition to the descriptions of the adult forms and of the pupae and cocoons and keys to the subgenera and species, including both sexes of the adults and the pupae, notes are given on their habitat, distribution, association, etc. A bibliography of 58 titles is included.

The screw worm situation in 1935, W. E. Dove and F. C. Bishopp (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1076–1085, fig. 1*).—This is a review of the screwworm (*Cochliomyia americana* C. & P.) situation in 1935 and the results of the control campaign.

Parasites of horn fly and other flies breeding in dung, A. W. Lindquist (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1154–1158*).—In the course of the studies of parasites and predators of blowflies at Uvalde Tex., *Spalangia muscidarum stomoxysiae* Gir. and *S. drosophilae* Ashm. were found to be attracted to dry or partly dry cattle droppings. *S. muscidarum stomoxysiae* attacks pupae of *Sarcophaga*, *Cryptolucilia*, the horn fly, and the housefly in and under cattle droppings. *Spalangia drosophilae* parasitizes small dipterous pupae but will also attack the horn fly. The average developmental period of *S. muscidarum stomoxysiae* was 22.8 days during the spring and summer, with a daily mean temperature of 83.1° F. Adult longevity was as much as 25 days with *S. muscidarum stomoxysiae* and 31 days with *S. drosophilae*. The percentage of parasitization by *Spalangia* was determined by collecting and segregating the dipterous pupae in and under cattle droppings. In 67 field droppings 14.6 percent of the *Sarcophaga* and *Cryptolucilia* that migrated and 43.8 percent of those that remained in the manure were parasitized by *Spalangia*. With the horn fly 38.2 percent of those that migrated and 64.3 percent of those in the manure were parasitized. Over 95 percent of the *Spalangia* were *S. muscidarum stomoxysiae*. A staphylinid beetle, *Baryodma bimaculata* Grav., accounted for a parasitization of 24.9 percent of the *Sarcophaga* and *Cryptolucilia*. In a series of 96 artificial patches of cow dung infested with horn fly, a total parasitization of 15.1 percent by *Spalangia* occurred. *S. muscidarum stomoxysiae* is considered to offer possibilities as a means of biological control of the horn fly, its habits being favorable to artificial propagation.

Preliminary tests with liquid bait in Japanese beetle traps, F. W. Metzger, W. E. Fleming, E. G. Rex, and W. W. Maines (*Extermin. Log, 4 (1936), No. 7, pp. 16, 17, fig. 1*).—Tests of geraniol (10 parts) and eugenol (1 part), vaporized by means of a wick inserted in a bottle containing the attractants, made with a view to devising a bait which will maintain maximum attractiveness for the Japanese beetle over a considerable period of time (several weeks), have been promising. The results indicated that when certain sized wicks were used in two types of traps more beetles were captured than in check traps containing the bran-molasses bait with the attractants added.

On the first instar larvae of some species of Otiorrhynchus found on strawberries, with notes on their biology, J. H. Fidler (*Bul. Ent. Res., 27 (1936), No. 3, pp. 369–376, figs. 4*).—A report is made of studies undertaken to

discover some practical means of identification of newly-hatched larvae of the black vine weevil, *O. rugosostriatus* Goeze, the strawberry root weevil, and *O. rugifrons* Gyll.

Field movement of boll weevils in relation to initial infestation and rainfall, G. L. SMITH and M. T. YOUNG (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1063–1066, fig. 1*).—A comparison of bollweevils in movement, as recorded on screens at Tallulah, La., from 1933 to 1935, shows a positive correlation between the number of weevils taken and the total rainfall over the corresponding period. It also indicates a positive correlation between the number of weevils taken and the number of days with 0.3 in. or more of rainfall.

Boll weevil activity during normal hibernation period at Tallulah, La., R. C. GAINES (*Jour. Econ. Ent.*, 29 (*1936*), *No. 6, pp. 1096–1099, fig. 1*).—Observations during 1928–29 and from 1930–31 to 1934–35 here reported have shown that a surprisingly large number of bollweevils become active during the normal period of hibernation. Under artificial cage conditions 1 percent of the total bollweevil activity occurred when maximum temperatures ranged from 36° to 45° F. The screen records indicated that maximum temperatures of 62° or higher are necessary before actual flight takes place.

Western rose curculio Rhynchites bicolor wickhami Ckl., J. L. HOERNER (*Colorado Sta. Bul. 432 (1936), pp. 19, figs. 6*).—The western rose curculio *R. bicolor wickhami* is one of the most destructive pests of wild and cultivated roses in Colorado, even a few beetles being capable of destroying the entire crop of roses on small bushes by their punctures in the buds or in the stems below the buds. It does not so readily attack the climber and rambler roses, but feeds on these and on raspberry buds in rearing cages when no other food is available. In addition to the egg punctures, the female will puncture the stem of the bud so that it will wilt and usually bend over and dry, leaving the mummified bud in which the larva develops. A pair of beetles in rearing cages have made as high as 99 punctures in rosebuds in 24 hr.

Technical descriptions are given of its several stages and a summary of information on its life cycle. The larvae pass the winter in the soil, pupate in April or early May, transform to adults in about 9 days, and emerge from the soil 2 weeks later. The eggs, of which some 40 are deposited by each female, hatch in about 10 days. The larvae feed inside the dry rosebud, leaving it to enter the ground. There is one generation a year.

A single ichneumonid larval parasite, *Temelucha* sp., was found associated with it, but not in numbers sufficient to check the development to any great extent. The results of work with insecticides on caged beetles are presented in detail in table form. Hand picking of the beetles as they appear on the rosebuds did not prevent serious injury, but hand picking of the buds and destroying them, thus preventing development of the larvae, was found to give protection the following year. The best control of the beetle has been obtained by the use of calcium arsenate applied as dust to the foliage of the plants. Carbon disulfide emulsion, 0.35-percent strength, applied at the rate of 1 qt. to a square foot, gave good control of the overwintering larvae.

New injurious Curculionidae (Col.) from South America, G. MARSHALL (*Bul. Ent. Res., 27 (1936), No. 3, pp. 497–501, figs. 3*).—*Premnotrypes fractirostris*, reared in England from potatoes received from Peru, *Hypsonotus parceguttatus* and *H. modestus*, both attacking leaves of cacao in Brazil, and *Acalles camelus*, attacking leaves and fruit of cacao in Brazil, are described as new.

Effect of reduced temperature and pressure upon honeybee respiration, C. E. WOODWORTH (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1128–1132, figs. 2*).—The author reports upon work conducted in continuation of that previously noted (E. S. R., 68, p. 361). It is pointed out that within ordinary

ranges of temperature, from 20° to 25° C., there is a zone of comfort in which standard metabolism is fairly constant. Above and below that point an irritation metabolism sets in which is physically recognized among honeybees by increased muscular activity and fanning. At low temperatures, 10°, for example, a numbing is experienced, with low metabolism as a consequence. Reduced pressure in the numbed condition in general reduces metabolism. Extremely low pressures bring in another factor, perhaps evaporation, which slightly increases carbon dioxide output. There is at first, in cases of reduced pressures, an increase in metabolism which later wears off. This may be called the compensatory metabolism, after which the real reduced pressure effect reveals itself which is found to be a reduced metabolism.

The organism of European foul-brood of bees, H. L. A. Tarr (*Nature [London], 137 (1936), No. 3456, pp. 151, 152, fig. 1*).—During the course of work at the Rothamsted Experimental Station (E. S. R., 75, p. 385) on the etiology of European foulbrood, a detailed study was made of 10 strains of *Streptococcus apis* isolated from affected larvae from a number of different cases of this disease.

These cultures could be divided into two groups, one of which caused the rapid and complete liquefaction of gelatin and coagulated and peptonized the casein of milk, the other leaving these proteins apparently unchanged. Four of the strains examined fell into the first named group, and 6 into the other group. In all other respects these strains were identical. Morphologically they were indistinguishable, and all gave identical fermentation reactions. Thus, all formed acid from dextrin, sucrose, lactose, maltose, glucose, fructose, galactose, mannose, mannitol, glycerol, and salicin, and none of them produced acid from starch, inulin, raffinose, arabinose, xylose, inositol, adonitol, and erythritol under the experimental conditions.

On the control of household ants, H. W. Thompson and L. R. Johnson (*Bul. Ent. Res., 27 (1936), No. 3, pp. 393–397, fig. 1*).—The authors have used a thallium sulfate syrup as a poison bait with success against Pharoah's ant and *Acanthomyops (Donisthorpea) niger*, and conclude that this inexpensive method is likely to prove useful in places where it is not practicable to find and destroy the nest.

A new species of Habrolepis parasitic in Chrysomphalus aurantii Mask., H. Compere (*Bul. Ent. Res., 27 (1936), No. 3, pp. 493–496, fig. 1*).—Contributing from the California Citrus Experiment Station, an account and description are given of a new parasite of the California red scale reared in the Transvaal, Union of South Africa, under the name of *H. rouxi*.

On the biology of Emphytus cinctus, L., and Blennocampa waldheimi, Gimm. (Hym., Symphyta), H. W. Miles (*Bul. Ent. Res., 27 (1936), No. 3, pp. 467–476, pls. 2, figs. 2*).—This contribution relates to two sawflies (the curled rose sawfly and *B. waldheimi*) found to be of economic importance in Britain, where the first mentioned is an enemy of the rose and both attack the strawberry.

A new pecan sawfly, Megaxyela langstoni n. sp. (Hymenoptera: Xyelidae), H. H. Ross (*Ent. News, 47 (1936), No. 5, pp. 131, 132*).—A sawfly reared from the pecan at the Mississippi Experiment Station is described as new under the name *M. langstoni*.

Observations on bulb scale mite as a major pest of narcissus, C. F. Doucette (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1103–1105*).—Observations of the bulb scale mite here reported upon have shown it to be one of the major pests of narcissus. Thermal treatments are the only dependable methods of control at present. Submerging the bulbs in warm water at 110° F. for 1 hr.

effects complete mortality of all stages, with sufficient margin to allow for any variations which might occur in large quantity treatments. Vapor heat treatment will also effect complete mortality when used for 2 hr. at 110°–111°. In both methods the period of treatment is exclusive of the time required for the bulbs to reach the treatment temperature. These treatments are best used for planting stock from which bulbs are to be selected for sale the following season. Bulb producers who have been following a general thermal treatment program for their stocks have experienced little trouble with this mite.

Biology and economic importance of the Gulf coast tick, F. C. Bishopp and H. Hixson (*Jour. Econ. Ent., 29 (1936), No. 6, pp. 1068–1076, figs. 2*).—A study is reported of the Gulf coast tick, which since the screwworm (*Cochliomyia americana*) invasion of the Gulf States eastward of Louisiana has assumed an economic importance second only to the cattle tick. This is due particularly to its attachment to and wounding of the inner surface of the ear of various animals.

Starvation record set as ticks survive for five years (*Sci. News Letter, 30 (1936), No. 812, pp. 278, 279, figs. 2*).—In the course of work with relapsing fever of man, specimens of *Ornithodoros turicata* collected in Texas were alive at the end of 5 yr. of confinement in the laboratory, at which time they fed upon and transmitted spirochetes to their monkey host.

ANIMAL PRODUCTION

The mechanical aspect of the nutrition of farm stock, E. J. Sheehy (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1936), No. 29, pp. 257–280*).—This study involved a series of 13 paired feeding trials with young pigs, in each of which a well-balanced ration of corn meal, barley meal, meat meal, and salt was compared with a ration of similar nutritive value in which a portion of the grain was replaced by one or more ingredients in an attempt to improve the ration from the standpoint of its mechanical action on the digestive tract.

In all trials, the concentrated basal ration exerted a costive effect and the pigs failed to consume an optimum quantity. Replacing an equivalent amount of the grain in the ration with 20 percent of linseed meal or from 10 to 20 percent of wheat bran increased the appetite of the pigs, improved the character of the feces, and enhanced the value of the ration. Ground oats did not exert a like favorable influence on the concentrated ration, although the substitution of oats for corn in the absence of bran or linseed meal did not lower the nutritive value. The addition of linseed meal to a ration containing 25 percent of wheat bran did not improve its value. The substitution of oats for corn in a ration containing bran or linseed meal showed oats to be decidedly inferior to corn under these conditions. The addition of carrageen moss or paraffin oil to a very concentrated ration improved the character of the feces and caused the pigs to be less restive. However, the effect gradually diminished and eventually decreased the appetite of the animals. The addition of green feed to the concentrated ration proved it to be equally as effective as either bran or linseed meal as a source of bulk and also a valuable source of vitamin A.

The author gives an extended discussion of the mechanical action exerted by different types of feed in the digestive tract, and points out the need for distinguishing between those feeds which supply bulk merely through their high fiber content as contrasted with those feeds which exert a beneficial action within the intestines due to their lubricative action or to their water-holding or succulent qualities.

Reproductive capacity of female rats as affected by kinds of carbohydrates in the ration, C. H. Whitnah and R. Bogart (*Jour. Agr. Res. [U. S.], 53 (1936), No. 7, pp. 527–532, pl. 1*).—In this study at the Kansas Experiment Station, the experimental rations contained casein 20 percent, butter oil 20, starch 30 percent and (as an additional source of carbohydrates) either sucrose, lactose, or starch 20 percent, plus yeast, Osborne and Mendel salt mixture, and cod-liver oil. Female rats reared on these various diets were placed with fertile males at ages ranging from 48 to 80 days and were allowed to remain for 40 days or until pregnancy was detected.

The sucrose-containing diet proved inadequate for normal reproduction, only one female in this group producing a live litter and she was afterwards sterile. Precocious sexual development and extreme luteinization of follicles and persistency of corpora lutea were generally observed in this group. Changing these animals from the experimental rations to the regular stock ration during adult life did not restore their reproductive function. The ovarian abnormalities indicated that sucrose may have either directly or indirectly affected the activity of the pituitary. Animals fed the lactose- and starch-containing rations reproduced normally and had normal ovarian structures.

The utilization of energy at different levels of protein intake, S. R. Johnson, A. G. Hogan, and U. S. Ashworth (*Missouri Sta. Res. Bul. 246 (1936), pp. 62, figs. 6*).—This bulletin presents results of eight series of paired feeding trials with growing rats on rations which contained amounts of protein adequate and inadequate for normal growth. In most cases three pairs of litter mates were used in a series, one pair being subjected to carcass analysis after a 3-day preliminary feeding period, one pair used for determining the digestibility of the ration, and the other pair for measuring the respiratory exchange using the Haldane open-circuit gas absorption train. Total feed consumption, total body weight gains, and composition of all carcasses at the end of the trial were also determined.

In each instance growth was more rapid on the reasonably high protein diet than on the like diet inadequate in protein. Digestibility of the food constituents, except protein, was practically identical for the high and low protein groups. The higher percentage protein digestibility in the high intake group is attributed to fecal metabolic nitrogen. Heat production averaged about 3.5 percent higher in the high protein group, while the higher respiratory quotient of the low protein group indicated a greater fat storage than for the high protein group. Carcass analyses showed that animals on high protein diets stored more water, protein, and ash and consequently less energy per unit of gain than their pair mates on low protein intake which stored more fat, hence more energy per unit of gain. The net utilization of energy for body gain by all animals was adjudged the same. The adaptability of the paired feeding technic to various types of nutrition research is discussed in the light of these findings.

An improved synthetic ration for vitamin B_4 studies, O. L. Kline, H. R. Bird, C. A. Elvehjem, and E. B. Hart (*Jour. Nutr., 11 (1936), No. 6, pp. 515–528, fig. 1*).—This study at the Wisconsin Experiment Station relates to the incidence of nutritional paralysis in chicks due to vitamin B_4 deficiency as previously noted (E. S. R., 71, p. 364). It is shown that failure to consistently produce evidence of vitamin B_4 deficiency in chicks under experimental conditions is largely due to the presence of this factor in various constituents of the synthetic diet. This revised method of study prescribes the use of a diet designated as ration 452. The principal changes in this diet over those previously used include (1) purification of the casein by dissolving crude casein in dilute

ammonium hydroxide, reprecipitating with dilute hydrochloric acid, and washing with distilled water, this process being repeated three times before drying the precipitate; (2) the use of highly potent sources of the factors in the vitamin B complex other than B_4; and (3) the inclusion of 2 percent of water-extracted dried lung tissue as a potent source of the "gizzard factor." Nutritional paralysis occurred in 100 percent of the chicks on this improved basal synthetic ration. Supplements of 15 percent of dried brain tissue, dried kidney tissue, or peanuts replacing an equal percentage of dextrin in the diet supplied ample B_4 for normal development.

The authors sum up the problem in these words: "Although we speak of ration 452 as one for the production of vitamin B_4 deficiency, it is impossible to conclude that it is complete in all other factors. We know that the addition of 15 percent peanuts, brain, or kidney as sources of vitamin B_4 will produce normal chicks. We have also had fair success with certain B_4 concentrates, but until normal chicks are reared on ration 452 plus pure vitamin B_4 the possibility of still other factors must be considered. We also want to emphasize that ration 452 may not be a perfect ration for B_4 assay. Many improvements may be made in the future, but it is the best available at present."

The distribution of vitamin B_4 in some plant and animal products, O. L. Kline, H. R. Bird, C. A. Elvehjem, and E. B. Hart (*Jour. Nutr., 12 (1936), No. 5, pp. 455–460*).—Following the plan for producing vitamin B_4 deficiency in chicks as described above and employing the depleted chicks as test animals, the authors have determined the vitamin B_4 potency of a considerable number of both vegetable and animal products. The results of these assays are presented in tabular form. Dried grass, peanuts, wheat germ, pork brain, and pork kidney were found to be relatively good sources of the factor. The grains were found to be relatively poor sources, although white corn and hulled oats proved definitely superior to wheat and yellow corn.

[**Livestock investigations in Colorado**] (*Colorado Sta. Rpt. 1936, pp. 12, 13*). Results are briefly reported on the use of different supplements to North Park hay for wintering beef calves; and mineral and protein supplements for fattening lambs.

[**Experiments with livestock in Texas**] (*Texas Sta. Rpt. 1935, pp. 9, 10, 18, 20, 21, 23, 24, 35, 37–41, 42, 117–119, 122–124, 146, 147, 149–151, 200, 201, 204, 205, 219, 220, 230, 231, 232, 233, 234, 240, 241*).—Beef cattle investigations, reported by J. M. Jones, J. H. Jones, P. R. Johnson, R. A. Hall, J. J. Bayles, R. E. Dickson, E. K. Crouch, F. E. Keating, R. H. Stansel, J. H. Knox, H. Schmidt, W. H. Dameron, I. B. Boughton, W. T. Hardy, and O. L. Carpenter, include a study of the mineral requirements of cattle in various sections of the State, Sudan grazing v. Sudan grazing and cottonseed meal, vitamin A requirements in wintering rations, ground cotton burs v. cottonseed hulls in the ration, rice bran in the concentrate ration for fattening beef calves, the rate of fattening of individually fed and group-fed steers and the relationship of type and individuality of steers to rate and economy of gain, the adaptability of Herefords to east Texas, the value of sugarcane bagasse, the need of protein supplement on east Texas pastures, and native and improved pastures in the Gulf Coast prairie.

Sheep and goat studies, reported by J. M. Jones, B. L. Warwick, Dameron, D. A. Spencer, S. P. Davis, Boughton, Hardy, Carpenter, and F. B. Matthews, include the adaptation of Corriedale sheep to southwest Texas conditions, the relation of skin folds to weight of fleece on Rambouillet sheep, grades and shrinkages of Texas wool and mohair, the relation of age of animals to fineness of wool and mohair type, crutching or tagging of bred Rambouillet ewes, the value of bonemeal and cottonseed meal in the salt lick of breeding ewes, and

the occurrence of the deficiency disease called jimmies in sheep and goats which apparently is prevented by including cottonseed cake and bonemeal in the ration.

In swine studies results are reported on rice and rice byproducts for growing and fattening pigs, the average daily gains and feed requirements for pigs, Sudan grass and oat pastures for fattening pigs, the calcium requirement of pigs on grain rations balanced with cottonseed meal, and self-feeding brood sows, all by F. Hale; the effect of vitamin A-deficient rations on embryonic eye development in pigs, by Hale and Schmidt; methods of storing sliced cured bacon in oils, by S. Cover and Hale; and curing and storing pork in west Texas, by Hale, R. W. Snyder, and D. L. Jones.

Poultry studies, under the leadership of R. W. Sherwood, G. S. Fraps, and J. R. Crouch, yielded information on the requirements of chicks for vitamins A and D, the vitamin or curative material which prevents slipped tendon and favorably affects the condition of the plumage in chicks, the productive value of feeds as determined by slaughter experiments, the calcium and phosphorus requirements of chicks, and the mineral requirements for commercial chicken and turkey feeds.

Data are reported on the yield and nutritive value of spineless cactus (*Opuntia ellisiania*), by Dameron and Carpenter. Chemical studies of feeding stuffs, by Fraps and F. D. Fuller, yielded information on the mineral and vitamin content of commercial feeds, the value of low grade feeds, and the need for iodine in Texas feeds and foods.

The determination of the apparent digestibility of green and cured grass by modified procedures, J. C. Knott, H. K. Murer, and R. E. Hodgson (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 7, pp. 553–556*).—In trials at the Washington Experiment Station, a modified method of determining apparent digestibility was compared with the standard method in 6 digestion experiments with 17 sheep. The modified method consisted in determining the ratio of the amount of a given food substance to the amount of iron in the feed and feces. The iron balance for the different sheep varied from a retention for the 14-day period of over 20 percent of the iron ingested to an iron content of the feces of over 40 percent in excess of that ingested. The apparent digestibility calculated by the modified method varied significantly both above and below that obtained by the standard method. The variations obtained in iron balances and apparent digestibility by the modified method indicate that the use of this method is not justified in the case of ruminants.

A comparison of the chemical composition of pasture grass with a mixed concentrate, E. Bennett (*Jour. Dairy Sci.*, *19* (*1936*), *No. 9, pp. 623–629, figs. 2*).—This study at the Massachusetts Experiment Station has shown that fertilization of pasture results in an increase in the protein and ash and a decrease in the crude fiber and nitrogen-free extract content in the dry matter of the grass. No significant differences were noted in the feed constituents, except that the fertilized grass contained a higher percentage of sucrose and a correspondingly lower hemicellulose content. The dry matter of the fertilized grass and a concentrate mixture, respectively, contained 18.4 and 19.4 percent of crude protein, 23 and 7.7 crude fiber, 3 and 5.4 ether extract, 45.9 and 60.2 nitrogen-free extract, and 9.6 and 7.2 percent of ash. The nitrogen fractions were very similar in the protein of each feed, each containing over 90 percent of protein nitrogen and with no traces of nitrate nitrogen occurring in either. The higher fiber content of the grass is due to the large amount of cellulose, the lignin content being only 1.75 percent greater than in the concentrate. The concentrate was characterized by a relatively higher percentage of sugar and starch. These results demonstrate that the dry matter content

of pasture grass in a vegetative state is comparable to a concentrated feed, and in the case of fertilized grass it closely approaches a nitrogenous concentrate in feeding value.

The composition and apparent digestibility of the flat pea (Lathyrus silvestris Wagneri), R. E. HODGSON and J. C. KNOTT (*Jour. Dairy Sci., 19 (1936), No. 8, pp. 531–534*).—Trials conducted at the Washington Experiment Station showed flat pea hay harvested in the late-bloom stage to contain 82.9 percent dry matter which was 60.3 percent digestible. The percentage in the dry matter and the digestibility coefficients of the various constituents were, respectively, as follows: Crude protein 25.3 and 78.3, crude fiber 29.8 and 41.9, ether extract 2.2 and 45.8, nitrogen-free extract 36.6 and 65.2, and ash 6 and 51.6. Inasmuch as the hay was readily consumed without waste, it may be ranked as a palatable and highly nutritious forage.

The protein content of soybean hay, L. E. THATCHER and J. B. PARK (*Ohio Sta. Bimo. Bul. 183 (1936), pp. 131–136*).—This report presents data on the relative amounts of the soybean plant of the Manchu and Peking varieties represented in the leaves, the stem and pod, and the seed, and the protein content of each fraction harvested at five different stages of maturity. The most notable features of these results were the pronounced decrease in the proportion of leaves and the marked increase in the proportion of seed and also a slight increase in the proportion of stem and pod as the plants mature. The protein content declined gradually in the leaves and showed a very pronounced drop in the stem and pod, but remained rather constant in the seed as the plants approached maturity. The relation of these data to the choice of varieties and the proper stage for harvesting are briefly discussed.

Further studies on vitamins in alfalfa hay, C. E. VAIL, J. W. TOBISKA, and E. DOUGLASS (*Colorado Sta. Tech. Bul. 18 (1936), pp. 19*).—Reporting further investigations (E. S. R., 69, p. 839), this phase of the study deals with the effect of rapid artificial drying, drying in artificial light, green crushing and drying, and manner and length of storage on the content of vitamins A, B, and G in alfalfa hay, and the comparative vitamin content of common, Cossack, Turkestan, and Grimm varieties of alfalfa.

Results of vitamin A studies indicate that the usual methods of curing and stacking, exposure to ultraviolet light in the presence of moisture, and storage of alfalfa meal in cloth bags, each led to extensive loss or inactivation, while curing indoors, rapid artificial drying, crushing and rapid drying, and also storage of hay in the bale and storage of alfalfa meal in paper bags were effective means of conserving this vitamin. All varieties studied carried more vitamin A in the third cutting and all varieties contained similar quantities for a given cutting, except third cutting common which averaged considerably less than the other three varieties. In all cases vitamin A activity decreased with increasing length of storage.

Vitamin B studies indicate that alfalfa has a relatively low content of this factor (1 to 3 units per gram). Prolonged storage and other harsh treatments caused deterioration or total destruction of this factor. The small differences in the content of different varieties slightly favored the common.

Vitamin G studies show a content of from 3 to 5 units of this factor per gram of fresh Colorado alfalfa. Artificial drying was not harmful to this factor and crushing caused an apparent increase in activity, while some evidence of destruction was noted in top-weathered hay from stacks. No significant differences due to variety were found.

Commercial feeding stuffs, 1935–36, E. R. TOBEY (*Maine Sta. Off. Insp. 160 (1936), pp. 19–79*).—This is the usual report of the analyses for protein, fat,

and fiber of 959 samples of feeding stuffs collected for official inspection during the year ended June 30, 1936 (E. S. R., 74, p. 678).

Inspection of commercial feeding stuffs, 1936, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul. 292 (1936), pp. 59*).—This is the usual report of the guaranteed and actual analyses of 384 brands of feeding stuffs collected for official inspection during the year ended June 1936 (E. S. R., 74, p. 378).

Speeding-up beef feeding, W. G. R. PATERSON (*Farmer and Stock-Breeder and Agr. Gaz., 50 (1936), No. 2441, p. 1725, figs. 3*).—In a brief report of beef cattle feeding trials at the West of Scotland Agricultural College, it is shown that the overfeeding of concentrates may frequently occur, resulting in excessive costs per unit of gain.

Two uniform lots of cattle were compared over a 12-week feeding period. The animals in lot 1 were started at 6 lb. of concentrates daily and gradually increased to 8.5 lb., while those in lot 2 started at 8 lb. and increased to a maximum of 10.5 lb. Liberal allowances of swedes, hay, and straw were fed in addition. The average daily gain per animal was 2.6 lb. and 2.5 lb. for the two lots, respectively. In a second similar trial a group started at 5 lb. daily and increased to a maximum of 7.5 lb. made as rapid daily gains as the lot receiving from 6 to 8.5 lb.

In another trial sprouted corn which had reached a height of from 6 to 9 in. was fed to replace approximately 20 lb. of swedes (on dry matter basis) in the ration of fattening cattle. The animals in this lot made an average daily gain of 3.1 lb., with evidence that the sprouted corn exerted a pronounced beneficial effect on the utilization of the remainder of the ration.

The weights of the carcass and of the individual organs in the body of cattle in Kenya Colony, M. H. FRENCH (*Empire Jour. Expt. Agr., 4 (1936), No. 14, pp. 108–115, pl. 1*).—This contribution presents data on the live weight and the actual and proportional distribution of weight in the body of zebu cattle of Kenya and Tanganyika Territory in comparison with that of cross-bred zebu-European cattle and also with the average of the common British and American breeds. The significance of these data in relation to the suitability of zebu cattle for beef production is discussed.

The occurrence of a britch-poll fibre-type array gradient in the New Zealand Romney lamb, N. GALPIN (*Empire Jour. Expt. Agr., 4 (1936), No. 14, pp. 116–128, figs. 5*).—It has previously been recognized that definite fiber-type arrays occur on different parts of the body coat of lambs, and the probable cause of fiber-type arrays has been postulated (E. S. R., 74, p. 379). This study was undertaken to determine whether or not an orderly relation exists between the fiber-type arrays occurring on different parts of the body. Romney lambs and also a limited number of Ryeland and Southdown lambs were included. Wool samples were taken from 15 different points on the body, and each sample was sorted according to a given classification of the fiber groups.

Based on the extent to which the fiber-type arrays were depressed, it is shown that there is a general gradient from britch to poll, i. e., a posterior-anterior gradient. This gradient is gradual and orderly, there being no sudden transition of array types in adjacent areas. There is also a gradient up the sides of the body which is subsidiary to the posterior-anterior gradient, the areas of least depression invariably occurring on the britch. The degree of medullation in the coat fiber was associated with the type of fiber array occurring, being most prevalent in those coats where the fiber areas were only slightly depressed and occurring less frequently where the areas were more depressed. Some medullation was observed in all Romney coats and to some extent in Ryelands but was negligible in the Southdown breed.

The heat production of the sheep and the pig before and after castration, E. G. RITZMAN, N. F. COLOVOS, and F. G. BENEDICT (*New Hampshire Sta. Tech. Bul. 64 (1936), pp. 24*).—The authors have determined the effect of castration upon the respiratory metabolism of 6 normal, healthy male sheep and 1 normal, healthy male pig. Five of the sheep were castrated at about 5 mo. of age, the remaining sheep at 1 yr., and the pig at 6 mo.

Pertinent data, including body temperature, heart rate, and heat production as computed from the gaseous exchange determined in open-circuit respiration chambers, are presented in tabular form and fully discussed. Castration of the sheep and pigs at the age of puberty and adolescence seemed to result in a decrease in energy needs of from 5 to 10 percent. Only an insignificant proportion of this decrease can be attributed to lessened muscular activity, the major part of the effect being attributable to the absence of the testicular hormones. It is suggested that the effect might be still greater in animals castrated after reaching maturity.

The basal metabolism of the goat, E. G. RITZMAN, L. E. WASHBURN, and F. G. BENEDICT (*New Hampshire Sta. Tech. Bul. 66 (1936), pp. 23, figs. 2*).—The authors have determined the body temperature, heart rate, and gaseous exchange by use of open-circuit respiration chambers on 18 goats, including 10 adult does, 6 young does, 1 adult buck, and 1 young buck. In most cases the experiments were conducted with animals at rest, in a fasting state, and at environmental temperatures of from 20° to 28° C. Pertinent data are presented in tabular form.

The basal heat production per 24 hr. per kilogram of body weight was 22.2, 20.7, 24.8, and 30.4 calories for the adult buck, adult does, young buck, and young does, respectively. In comparison with other types of farm animals it is shown that the basal metabolism of goats (expressed as calories per 10 $w^{2/3}$) is consistently below that of horses, beef steers, dairy cows, swine, or sheep.

Critical study of important factors in successful pig-keeping, C. P. MCMEEKAN (*New Zeal. Jour. Agr., 52 (1936), No. 5, pp. 278–289*).—Based on an analysis of a large number of individual litter records in New Zealand, several factors are discussed in relation to the efficiency of pork production. These points include the importance of heavy litters; the relative importance of number and weight of pigs upon litter weights; the extent, nature, and importance of mortality; the effect of age of the sow; the effect of season of farrow; the influence of breed and strain; litter variation and the effect of size of litter and weaning weight; and the influence of management.

Phosphorus requirements in the ration of growing pigs, C. E. AUBEL, J. S. HUGHES, and H. F. LIENHARDT (*Kansas Sta. Tech. Bul. 41 (1936), pp. 86, figs. 23*).—This bulletin presents the results of 3 experiments in each of which 3 similar groups of purebred Hampshire pigs were employed. All were castrated males and were placed on experiment immediately after weaning at about 9 weeks of age and averaging about 43 lb. in weight. The same basal ration, adequate in all respects except phosphorus supply, was fed throughout the experiments, each of which extended over a 24-week feeding period.

In experiment 1, lots 1, 2, and 3 (6 pigs each) received 0.15, 0.29, and 0.59 percent phosphorus in their rations, respectively, during the first 7 weeks of the trial and 0.18, 0.33, and 0.59 percent phosphorus during the remaining 17 weeks. Two pigs from each lot were slaughtered after 8 weeks, 2 others after 16 weeks, and the remaining 2 at the end of the trial. Data are presented on the condition of the carcasses, dressing percentages, relative size of the body organs, and bone analyses. In experiment 2, lots 4, 5, and 6 (6 pigs each) received 0.15, 0.23, and 0.3 percent phosphorus, respectively, throughout the trial, pigs being slaughtered at intervals as above. In experiment 3, lots 7, 8, and 9 (4, 3, and

3 pigs) received 0.23, 0.27, and 0.3 percent phosphorus, respectively, throughout the trial, no pigs being slaughtered until the end of the experiment.

Experiment 1 established the fact that 0.18 percent phosphorus in the diet is inadequate and results in marked symptoms of phosphorus deficiency, the most significant of which are (1) a subnormal level of inorganic phosphorus in the blood which averaged slightly over 3 mg per 100 cc; (2) subnormal growth, especially failure of the bones and muscle to develop normally; (3) decreased efficiency in utilization of feed and storage of energy, although the greater amount of feed required per unit of increase in body weight in the deficient group is partially offset by the fact that this group invariably stored a higher percentage of fat in proportion to body weight gain; (4) a pronounced decline in appetite; and (5) an increased thirst, causing pigs on low phosphorus rations to drink approximately twice as much water as those on sufficient rations; moreover urine excretion was nearly twice as great in proportion to water consumed for the former group as for the latter. The higher levels of phosphorus supplied to lots 2 and 3 proved adequate for normal growth and development, and no significant differences were noted in their effects.

Experiments 2 and 3, conducted primarily to establish the minimum phosphorus requirements within closer limits, confirm the results of the first experiment and indicate that the minimum phosphorus intake which permits normal growth and development lies between 0.27 and 0.3 percent of the ration. This is equivalent to a daily intake of about 6.5 g and 4 g of phosphorus per 100 lb. of live weight for 50-lb. pigs and 200-lb. pigs, respectively.

Comparison of management methods for chicks, layers, and breeding hens, C. W. Upp (*Louisiana Sta. Bul. 275 (1936), pp. 14*).—In two series of experiments early-hatched chicks grew faster and at a more uniform rate and showed a lower mortality than late-hatched chicks, clearly indicating the advantage of early hatching. Brooding results over a 4-yr. period showed that brooding on wire floors or in battery brooders is much more desirable than brooding on litter from the start or placing birds on litter at 4 weeks of age, particularly from the standpoint of coccidiosis control. Pullets placed in the laying house at 12 weeks of age were generally small at the beginning of the laying year and suffered relatively high mortality, with coccidiosis a contributing factor to this mortality.

Mortality of pullets in laying cages was generally similar to that of comparable lots with outdoor range and was consistently lower than that of pullets confined to laying houses, particularly those that did not have access to a sun porch. Birds having access to green feed in outdoor runs produced from 1 to 3 doz. more eggs and consumed less feed per bird and per dozen eggs than the confined lots. Fertility and hatchability were appreciably higher in the range pullets than in those confined on wire floors or stud mated in laying batteries.

The blood sugar of the fasting, gizzardectomized fowl (Gallus domesticus), W. H. Burrows, J. C. Fritz, and H. W. Titus (*Jour. Biol. Chem., 110 (1935), No. 1, pp. 39–41, figs. 2*).—In a study at the U. S. D. A. Beltsville Research Center comparing the blood sugar level of normal and gizzardectomized cockerels during a fasting period it is shown that the difference between the curves for the control and the gizzardectomized birds is no greater than between individuals in either group, leading to the conclusion that the gizzard plays very little, if any, part in the fluctuations of the blood sugar level of fasting chickens.

Effect of minerals and fiber on avian intestinal pH, V. G. Heller and R. Penquite (*Poultry Sci., 15 (1936), No. 5, pp. 397–399*).—Results of five series of

tests conducted at the Oklahoma Experiment Station are reported. Experimental subjects ranged from 6-week-old chicks to 1-year-old hens, and the rations were varied to cover a wide range of intake of basic salts, calcium-phosphorus ratios, and crude fiber content. Samples of the contents from eight different sections of the alimentary tract were taken for pH determinations. The intake of large amounts of basic salts caused a marked decrease in acidity in the fore part of the alimentary tract, particularly in the gizzard, but changes in the intestines were of small significance. Neither the range of calcium-phosphorus ratios employed nor the wide range in crude fiber intake produced any significant changes in pH values. Evidently the digestive tract of the fowl is well equipped to care for the normal changes in the food and water ingested.

The vitamin A requirements of the laying pullet, W. C. Russell, O. S. Platt, M. W. Taylor, and D. F. Chichester (*New Jersey Stas. Circ. 369 (1936), pp. 8*).—In the experiments herein reported seven pens of healthy pullets reared on range were started on experiment late in August and continued under confinement for a 12-mo. period. All lots received essentially the same basal ration, but the proportions of yellow corn and white corn and the supplements of alfalfa meal, vitamin A concentrate, and fresh green feed were varied so that the U. S. P. units of vitamin A per pound of feed were 400, 700, 1,300, 2,200, 3,800, 4,100, and 30,000 for lots 1 to 7, respectively. Data are reported on the percentage mortality, live weight changes, egg production, hatchability of eggs, mortality of chicks during the first 2 weeks of life, and vitamin A storage in the livers of the hens.

Aside from the somewhat higher mortality in lot 1 and the higher chick mortality in lots 1 and 2, there was no marked difference in the results obtained from the different lots. Maximum egg production was obtained from lot 4 (2,200 units). Values for liver vitamin A fell in essentially the order of the increasing amounts of this factor fed. Since 2,200 units of vitamin A per pound of ration, which is probably well below that present in poultry rations commonly fed, gave as satisfactory results as the larger quantities supplied in this experiment, it appears that the addition of more vitamin A to the usual poultry ration is of no value in improving egg production and hatchability or in reducing mortality.

A study of the vitamin A requirement of the chick during early life, R. C. Ringrose and L. C. Norris (*Poultry Sci., 15 (1936), No. 5, pp. 390–396, fig. 1*).—This contribution from the [New York] Cornell Experiment Station describes a biological method for assaying feeds for vitamin A, using chicks as test animals, based on the experimental findings that the vitamin A requirement of the chick during the first 8 weeks of life is about 150 U. S. P. X units per 100 g of feed consumed. Employing this method of assay yellow corn was found to contain 7 units of vitamin A per gram, and a number of corn gluten meal samples were found to contain from 7 to 25 units per gram.

Studies relative to the estimation of vitamin D.—IV, Effect of seasonal variation upon vitamin D assay, L. L. Lachat and H. A. Halvorson (*Poultry Sci., 15 (1936), No. 5, pp. 362–368, figs. 2*).—Continuing this series of investigations (E. S. R., 75, p. 827), day-old White Leghorn chicks were placed on the A. O. A. C. rickets-producing ration, certain groups being started around March 1 and others about August 1. Lots in each group included negative controls and those receiving various levels of U. S. Pharmacopeia "reference cod-liver oil" as well as commercial cod-liver and other fish oils.

From data obtained on growth rates and bone ash analysis it is concluded that the chick's response to vitamin D additions is variable, with definite seasonal trends. The chick's requirement per 100 g of A. O. A. C ration during

the 4-week feeding period was about 20.7 U. S. P. units of vitamin D for the spring months and about 23.8 units during the late summer and autumn months. It was further noted that negative controls have higher average ash in the autumn months than in the spring months, this difference being characterized by more rapid growth rate during the former season. The desirability of having a standard preparation containing vitamin D for poultry to obviate errors in interpreting results of assays of vitamin D carriers at different seasons of the year is pointed out.

Observations on the vitamin G requirement of the chicken, C. H. Hunt, P. R. Record, and R. M. Bethke (*Ohio Sta. Bimo. Bul. 183 (1936), pp. 187–190*).—In this experiment six lots of White Leghorn chickens were fed the same basal ration, known to be deficient in vitamin G, throughout the growth and production period. Vitamin G was supplied to the various lots in the form of 5 percent of alfalfa leaf meal, 5 percent of alfalfa leaf meal plus 2.5 or 5 percent of dried skim milk, and 2.5, 5, or 7.5 percent of dried skim milk, respectively.

The rate of growth was highly correlated with the amount of vitamin G consumed, the amount supplied from various sources being apparently of equal efficiency in promoting growth. The lots receiving the combined supplement produced the greatest number of eggs per hen. Those lots receiving 5 percent and 7.5 percent of dried skim milk produced well for a few months but declined rapidly in the latter months of the trial and suffered a high percentage of mortality. In the lots receiving the combined supplement the hatchability varied directly with the units of vitamin G transferred from the feed to the egg, but this condition did not hold true for hens receiving only dried skim milk, this supplement giving relatively low hatchability at all levels. The results indicate that the alfalfa leaf meal or a combination of alfalfa leaf meal and dried skim milk contain a factor or factors not contained in the dried skim milk alone and necessary for sustained production and good hatchability in the eggs so produced.

Energy and gaseous metabolism of normal and deutectomized chicks between 10 hours and 100 hours of age, H. G. Barott, T. C. Byerly, and E. M. Pringle (*Jour. Nutr., 11 (1936), No. 3, pp. 191–210, figs. 7*).—In studies at the U. S. D. A. Beltsville Research Center the heat production and gaseous exchange were determined for both normal and deutectomized chicks of both sexes by direct calorimetry. Chicks from 10 to 100 hr. of age were studied at atmospheric temperatures ranging from 68° to 104° F. The critical temperature was established at 96°. An increase or decrease of 7° from this critical temperature resulted in a 15-percent increase in metabolism, while further lowering of the temperature caused a constant rate of increase in metabolism until at 70° it was approximately doubled and the chicks unable to compensate for temperatures below 70°. Both normal and deutectomized chicks had a respiratory quotient of about 0.71 and a thermal quotient of 3.16, indicating a mixed fat and protein metabolism free of carbohydrates. The gram hour rate of metabolism for normal chicks was constant at any given temperature, but in deutectomized chicks it decreased continuously and in direct proportion to the time elapsed after the operation.

What is the effect of pure vegetable protein on the laying activity of hens? [trans. title], R. Fangauf and O. Brüninghaus (*Arch. Geflügelk., 10 (1936), No. 6, pp. 173–187; Eng. abs., p. 186*).—In experiments comparing rations containing meat meal as a source of protein with rations containing only vegetable protein (soybean oil cake) for laying hens, it is indicated that under conditions of free range vegetable protein could replace animal protein during the summer months without unfavorably affecting egg production, but that in winter months some source of animal protein is necessary to maintain optimum

production. No difference was noted between the two types of rations as regards body weight or egg hatchability. The addition of mineral supplements to the vegetable protein ration produced no beneficial effects.

The trend of egg production and mortality at the Vineland contest, C. S. Platt (*Poultry Sci., 15 (1936), No. 3, pp. 249–251*).—The New Jersey Experiment Stations have analyzed the data obtained from the Vineland egg-laying contest, including all Single Comb White Leghorn hens entered over 14 yr. It is shown that the percentage of mortality steadily increased from 1918 to 1927, when it had more than tripled, and has remained at this high level. There was no increase in rate of egg production until 1927, but from 1928 to 1933 it increased slightly. In each year of the contest the birds that died produced at a lower rate than the birds surviving, indicating that they constantly represented a distinct type of birds. Apparently in recent years a higher percentage of birds entered in the contest were of the type which would die early in life regardless of level of production.

Livability and production of pullet layers may be predetermined, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 183 (1936), pp. 136–140*).—This article is a further discussion of the problem previously noted (E. S. R., 75, p. 829). The difficulty of producing healthy layer pullets in close proximity to breeding and laying flocks is pointed out, and data are presented to show the superiority of pullets reared on comparatively disease-free farms over those reared in proximity to a breeding flock known to carry various poultry diseases. It is suggested that the production of disease- and parasite-free, livable, ready-to-lay pullets may be considered a desirable new phase of specialization in poultry raising.

Influence of ovulation rate on the tendency of the fowl to produce eggs in clutches, H. M. Scott and D. C. Warren (*Poultry Sci., 15 (1936), No. 5, pp. 381–389*).—In a study at the Kansas Experiment Station the authors have made observations on successive eggs laid by a group of 35 hens over a 28-day period. By palpation through the intestinal wall the forming egg can be detected in the isthmus of the oviduct about 4 hr. after ovulation. Tracing the eggs through the greater part of their formative period, it appears that either the first or second egg of the clutch required slightly more than 23 hr. to complete formation from the time it was first palpated in the oviduct. As further evidence that the first egg of the clutch required no longer time for formation than succeeding eggs, somite counts made on first and second eggs of the clutch after 38 hours' incubation were practically identical (8.64 and 8.79, respectively). When a clutch was terminated the first egg of the succeeding clutch could not be detected for more than 20 hr. after the previous egg was laid, thus indicating a delay in ovulation of more than 15 hr.

It is concluded that hens seldom ovulate in the afternoon, the "held" egg does not normally exist, the day of nonlaying is a result of delayed ovulation, and a new clutch is initiated when the hen lays the morning following the day of nonproduction.

Effect of supplementary iodine on egg size and quality, E. A. Johnson (*Poultry Sci., 15 (1936), No. 5, pp. 355–361*).—In a trial conducted at the Minnesota Experiment Station three lots of White Leghorn pullets received a dietary supplement of potassium iodide at rates of 0.5, 2, and 4 mg per hen daily, respectively, and in a later trial two similar lots received 4 mg per hen daily and at a rate of 3 oz. per ton of mash ration, respectively. In each case eggs from the experimental pens were compared with those from control pens on the same basal ration without iodine supplements. In no case was there any significant difference in egg size, percentage of thick albumin, yolk index, yolk weight, yolk color, or shell thickness following the addition of iodine to the

diet. Evidently the hen's requirement for iodine was amply supplied in the ordinary ration.

Sulfur in eggs, H. W. Marlow and H. H. King (*Poultry Sci., 15 (1936), No. 5, pp. 377–380*).—The Kansas Experiment Station has studied the distribution of sulfur in the yolk, thick white, and watery white of eggs and has found them to contain 1.08, 1.63, and 1.57 percent of total sulfur, respectively. In each instance sulfur was found to be organically bound and in the reduced form, the presence of cysteine being doubtful. Usually all the sulfur in either egg white or egg yolk is accounted for by the cystine and methionine sulfur.

The marketing of quick frozen poultry: The "Z" pack for ducks in the U. S. A., M. T. Zarotschenzeff (*Cold Storage, 39 (1936), No. 461, pp. 190, 191, fig. 1*).—This article briefly describes a method for quick freezing of poultry known as the Z process. In this process the dressed poultry is loaded on wooden trays and inserted into the freezing chamber, where a fine mist of brine at −5° F. passes over the trays, resulting in a very rapid heat transfer with no resultant shrinkage of the product since a relative humidity of nearly 100 percent is maintained. After freezing each carcass is rinsed in clear water and dipped in ice water which forms a glaze of ice that protects against freezer burn during subsequent storage. The results of brief analytical tests show that the bacterial content of the meat of carcasses frozen by the Z process and the oleic acid value of the fat was much lower than in the case of freezing by the slower commercial method.

Feed consumption and cost of feeding of Bronze turkey breeding stock, S. J. Marsden (*Poultry Sci., 15 (1936), No. 5, pp. 400–404*).—Studies at the U. S. D. A. Beltsville Reasearch Center show that young Bronze breeding hens consumed an average of 117.12 lb. of feed each per year. The weekly feed consumption for an 8-week winter period, a 16-week spring period, a 24-week summer period (feed limited), and a 4-week autumn fattening period was 3.23 lb., 2.73, 1.4, and 3.5 lb., respectively. The males consumed approximately twice as much feed as the hens. Based on existing feed prices the annual feed cost for males and females was $3.97 and $1.94, respectively. Feed consumption by hens declined somewhat during the third, fourth, and fifth years of production.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the 30th annual meeting of the American Dairy Science Association] (*Jour. Dairy Sci., 19 (1936), No. 7, pp. 432–435, 436–448, 450, 452–510, 520–525, figs. 2*).—Following are listed the titles and authors of papers pertaining either to dairy production or dairy manufacturing, presented at the annual meeting of the association (E. S. R., 74, p. 88) held at State College, Pa., June 1936: Studies on Aseptically Drawn Milk From Bang's Disease Positive and Bang's Disease Negative Cows, by H. B. Morrison and F. E. Hull (pp. 432, 433); Two Types of Blindness in Cattle and Their Possible Relation to Vitamin Deficiency, by A. H. Kuhlman, W. D. Gallup, and E. Weaver (pp. 433, 434); Production of White Spotted Kidneys in Calves, by L. A. Moore and E. T. Hallman (pp. 434, 435); Vitamin A Replaces Whole Milk in the Calf Ration, by H. T. Converse and E. B. Meigs (pp. 435, 436); Supplementing a Normal Ration for Dairy Calves With Cod Liver Oil, by P. M. Reaves and C. Y. Cannon (p. 436); The Physiological Effect of a Hegari Fodder and Cottonseed Meal Ration on Dairy Cows (Preliminary Report), by O. C. Cunningham, L. H. Addington, and E. M. Lantz (pp. 437, 438); The Vitamin A Requirements of Dairy Cows for Reproduction and Lactation Under Practical Conditions, by E. B. Meigs and H. T. Converse (p. 438); Reproduc-

tion of Dairy Cows on a Ration of Prairie Hay and Cottonseed Meal, by A. H. Kuhlman, E. Weaver, and A. Nalbandov (pp. 438, 439); The Effect of Sprouted Oats on Reproduction of Dairy Cattle, by H. P. Davis and I. L. Hathaway (pp. 439, 440); Magnesium Carbonate and Magnesium Oxide Supplements to a Whole Milk Ration for Dairy Calves, by C. F. Huffman and C. W. Duncan (pp. 440, 441); Gross and Microscopic Pathology Associated With Low Blood Magnesium in Dairy Calves, by L. A. Moore, L. B. Sholl, and E. T. Hallman (pp. 441, 442); Cod Liver Oil and Muscle Dystrophy in Calves, by G. Davis and L. A. Maynard (p. 442); Effect of Phosphorus Intake on the Calcium and Inorganic Phosphorus Content of Whole Blood of Dairy Heifers During the Periods of Gestation and First Lactation, by A. H. Van Landingham, H. O. Henderson, and G. A. Bowling (p. 443): Relative Utilization by Dairy Cows of Calcium and Phosphorus in Dicapho (Dicalcium Phosphate) and Bonemeal (Tricalcium Phosphate), by J. A. Newlander, H. B. Ellenberger, and C. H. Jones (pp. 443, 444); Body Analyses of Dairy Cows After Long Time Calcium and Phosphorus Balance Trials, by H. B. Ellenberger, J. A. Newlander, and C. H. Jones (pp. 444, 445); The Influence of Roughage on the Vitamin D Potency of Milk, by G. C. Wallis and T. M. Olson (pp. 445–447); A Further Study of the Factor in Soybeans Affecting the Vitamin A Value of Butter, by J. W. Wilbur, S. M. Hauge, and J. H. Hilton (p. 447); The Rate of Change in the Vitamin A Content of Milk, by W. C. Loy, J. H. Hilton, J. W. Wilbur, and S. M. Hauge (pp. 447, 448); Site of Synthesis of Fat in the Mammary Gland, by P. Kelly and W. E. Petersen (p. 448); Comparisons of Arterial and Mammary Venous Bloods as Related to Milk Secretion, by W. R. Graham, Jr. (p. 450); The Vitamin A Content of A. I. V., Molasses, and Normal Silage and the Effect of Feeding These Silages Upon the Vitamin A Content of Milk, by I. L. Hathaway, H. P. Davis, and J. C. Brauer (p. 452); Studies on A. I. V. Silage.—I, Preparation and Feeding, by C. F. Monroe and C. C. Hayden (p. 453); Studies on A. I. V. Silage.—II, Nutrient Preservation and Physiological Effects on the Cow, by A. E. Perkins and C. F. Monroe (pp. 453, 454); Studies on A. I. V. Silage.—III, Carotene Preservation and Biological Properties of the Milk, by W. E. Krauss and R. G. Washburn (pp. 454–456); Photographic Techniques as Applied to the Dairy Industry, by R. F. Morgan (pp. 456, 457); Alignment Charts for Estimating Profit per Cow and per Unit Milk, by S. Brody and A. C. Ragsdale (p. 457); A Lesson in Feeds, by R. B. Becker (pp. 458, 459); Production of Dairy Cows When Fed Only Silage and Cracked Soybeans, by N. K. Williams, C. Y. Cannon, and D. L. Espe (p. 459); Methods of Making Grass Silage, by T. E. Woodward (p. 460); Sweet Potatoes versus Silage for Milk Production, by R. H. Lush (pp. 460, 461); Soy Bean Hay as the Sole Roughage for Dairy Cows, by L. F. Herrman and G. A. Bowling (pp. 461, 462); Limited Grain Feeding of Dairy Cattle, by C. E. Wylie and L. R. Neel (p. 462); The Value of Grinding Grains for Lactating Dairy Cattle, by A. L. Darnell and O. C. Copeland (pp. 462, 463); The Feed Value of Oat Mill Feed as a Hay Substitute for Dairy Cows, by A. W. Lathrop and G. Bohstedt (pp. 463, 464); Milk and Butterfat Yields of Holstein Cows on Rations Restricted to Roughage, by J. R. Dawson and R. R. Graves (pp. 464, 465); Some Results of Eight Years of Investigation Concerning the Rôle of Roughage in the Diet of Ruminants, by S. W. Mead and H. Goss (pp. 465, 466); Spectrophotometric Data Bearing on the Character of the Pigments Obtained in Routine Determinations of Carotene in Hays, Silages, and Freshly Cut Plant Materials, by E. A. Kane, H. G. Wiseman, A. H. Hartman, and C. A. Cary (p. 466); Rate of Decomposition of Carotene in Hays During Storage at Different Seasons of the Year, by H. G. Wiseman, E. A. Kane, and C. A. Cary (pp. 466, 467); Effect of Moisture Content and Density of Stored Roughage

on Temperatures Attained During Storage and the Quality of the Product, by J. B. Shepherd, T. E. Woodward, and R. R. Graves (pp. 467, 468); The Effect of Certain Factors Upon the Color and Pigments of Alfalfa Hay in Storage, by T. E. Woodward (pp. 468, 469); Results Obtained When the Several Minnesota Reagents Were Employed for Testing Buttermilk, by D. F. Breazeale and E. W. Bird (pp. 470, 471); The Effect of Preservatives on the Results Obtained With Ice Cream Mixes by Several Testing Methods, by P. H. Hostetler, C. A. Iverson, and E. W. Bird (pp. 471, 472); The Determination of Citric Acid in Milk, by H. L. Templeton (pp. 472, 473); Vitamin C Content of Milk, by C. H. Whitnah and W. H. Riddell (pp. 473, 474); Vitamin C Content of Dairy Orange Beverages, by M. J. Mack, C. R. Fellers, W. A. Maclinn, and D. A. Bean (p. 474); Catalytic Destruction of Vitamins by Manganese During the Pasteurization Process, by A. D. Pratt (p. 475); X-ray Diffraction Studies of Cheese Protein During the Ripening of Cheddar Cheese, by S. L. Tuckey, H. A. Ruehe, and G. L. Clark (pp. 475, 476); The Relation of the Oxidation-Reduction Potential of Milk to Oxidized Flavor, by R. E. Webb and J. L. Hileman (p. 476); Some Observations on the Electrokinetic Potential of Milk Fat, by E. L. Jack and C. D. Dahle (pp. 476–478); A New Type of Quinhydrone Electrode for Directly Determining the Hydrogen-ion Concentration of Cheese and Other Materials, by G. P. Sanders and E. O. Whittier (pp. 478, 479); An Improved Motor Driven Curd Tester, by L. A. Chambers (p. 479); Use of a Dynamic Foam Meter for Measuring Foaming Ability of Ice Cream Mixes, by J. L. Minkin and J. H. Erb (pp. 479, 480); Milk Inspection Work in the United States, by T. B. Harrison (p. 480); A Study of the Abnormal Relationship of Fat to Solids-Not-Fat in Milk, by H. C. Moore and K. S. Morrow (pp. 480, 481); Quality-Composition Relationships in *Goat's Milk*, by J. C. Marquardt (pp. 481, 482); Observations on the Development of Rancidity in Sweet Milk, Cream, and Butter, by E. L. Fouts and E. Weaver (pp. 482, 483); Concerning the Cause of Rancid and Oxidized Flavors of Bovine Origin, by J. A. Anderson, J. G. Hardenbergh, and L. T. Wilson (pp. 483, 484); Study of the Causes of Bitter Flavor in Cream, by L. J. Manus and L. M. Thurston (pp. 484, 485); The Activatability of Milk with Ultra-violet Light, by W. E. Krauss, R. M. Bethke, and R. G. Washburn (pp. 485, 486); The Effect of Feeding Ergosterol to Cows on the Activatability of the Milk, by R. F. Light, L. T. Wilson, and C. N. Frey (p. 486); Treatment of Milk Previous to Separation and the Effect on Viscosity of Market Cream, by H. B. Henderson and H. B. Ellenberger (pp. 487, 488); A Study of the Adaptability of the Vacuum Seal for Milk Bottles, by W. H. Brown, P. H. Tracy, and M. J. Prucha (pp. 488–490); Instant Whipping of Cream by Aeration, by C. A. Getz, G. F. Smith, and P. H. Tracy (pp. 490, 491); The Influence of Method of Sterilizing Equipment Upon the Development of Oxidized Flavor in Milk, by A. C. Dahlberg and D. C. Carpenter (p. 491); Modified Medium and Incubation Temperatures as They Affect Bacteria Counts of Milk Containing Organisms Arising From Various Sources of Contamination, by A. Bradfield and H. B. Ellenberger (pp. 491–493); The Present Status of the Proposal to Change the Composition of the Agar and Temperature of Incubation of the Standard Agar Plate Technic of the American Public Health Association, by R. S. Breed (pp. 493, 494); *Streptococcus lactis* in Raw and Pasteurized Milks of Very High Quality, by E. S. Yawger, Jr., and J. M. Sherman (p. 494); The Characteristics of Freshly Isolated Cultures of *Lactobacillus bulgaricus*, by J. M. Sherman and H. M. Hodge (pp. 494, 495); The Heat Resistance of Colon Organisms in Milk, by C. N. Stark and M. C. Patterson (pp. 495, 496); The Significance of Bacterial and Chemical Changes Occurring in Mastitis Milk and Their Correlation With Milk Production, by L. A. Burkey, G. P. Sanders, and J. F. Cone (p. 496); Frequency of

the Escherichia-Aerobacter Species in Commercial Butter, by E. H. Parfitt (pp. 496, 497); A Comparison of Media Used for Determining the Bacterial Content of Ice Cream, by F. J. Babel and E. H. Parfitt (pp. 497, 498); The Effect of Certain Penicillia on the Volatile Acidity and the Flavor of Iowa Blue Cheese (Roquefort Type), by C. B. Lane (pp. 498, 499); Sanitary Aspects of Homogenized Milk, by M. J. Prucha and P. H. Tracy (p. 499); Wrappers for Processed Cheese, by H. L. Templeton (pp. 499, 500); A Study of Inexpensive Milk Pasteurizing Units for Cheese Factories, by W. V. Price (p. 500); Salting and Cooking Curds in the Manufacture of Several Varieties of Cheese, by J. C. Marquardt (pp. 500, 501); The Influence of Salt on the Composition and Quality of Brick Cheese, by E. L. Byers and W. V. Price (pp. 501, 502); The Utilization of Whey in the Preparation of Some New Food Products, by B. H. Webb and G. A. Ramsdell (pp. 502, 503); A Pasteurizing Difficulty Experienced Where Whey Cream is Processed, by L. C. Thomsen (pp. 503, 504); A Summary of Results of Experimental Studies of Certain Factors Affecting Churning Losses, by H. A. Derby, D. F. Breazeale, and E. W. Bird (pp. 504, 505); A Preliminary Report of the Effect of Certain Neutralizers on the Churning Loss and the Keeping Quality of the Butter, by D. F. Breazeale, N. E. Fabricius, and E. W. Bird (pp. 505–507); Some Factors Influencing the Spreadability of Butter, by S. T. Coulter and W. B. Combs (p. 507); A Proposed Score Card for Judging Churning Cream, by L. H. Burgwald and J. H. Erb (p. 508); A Comparison of Pressure and Centrifugal Homogenization of Ice Cream Mixes, by J. C. Hening (pp. 508, 509); The Use of Sodium Alginate as a Stabilizer in Ice Cream, by P. H. Tracy, G. L. Gibson, and S. L. Tuckey (p. 509); Recent Studies on the Use of Dextrose in Ice Cream, by W. J. Corbett and P. H. Tracy (pp. 509, 510); Alfalfa-Molasses Silage vs. Alfalfa Hay as a Roughage for Lactating Dairy Cows, by R. E. Horwood (pp. 520, 521); Calf Starters Fed Dry With Limited Whole Milk, by E. S. Savage (pp. 521–523); Sudan Grass and Sweet Clover as Temporary Pasture Crops, by R. A. Ackerman and H. O. Henderson (p. 523); Summer Decline in Milk Production, by H. O. Wales, J. W. Linn, and F. W. Atkeson (p. 524); and Feeding More Roughage to Dairy Cows, by C. F. Huffman (pp. 524, 525).

Report of the Chief of the Bureau of Dairy Industry, 1936, O. E. Reed (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1936, pp. 28*).—Investigations with dairy cattle at the Beltsville, Md., and field experiment stations have yielded results on the carotene requirements of dairy cattle, the tolerance of calves to massive doses of cod-liver oil, factors affecting green color and carotene in alfalfa, roughage production and preservation, milk production on sole roughage rations, the development and use of permanent and annual pastures, breeding for high milk and butterfat production, several phases of the physiology of reproduction, the relation of the conformation and anatomy of the dairy cow to her producing ability, milk yield from separate quarters of the udder, and the relationship of udder development in calves under 6 mo. of age to their milk-producing ability during first lactation.

In studies with dairy products, results were obtained on the sporicidal action of ultraviolet rays, the sequence of change in the udder and in the chemical and physical properties of milk at the onset of mastitis, oxidation in dairy products, relation of acidity of cream to keeping quality of butter, factors affecting the stability of ice cream, cream-plug formation in bottled cream, curd tension of milk, and activity of chlorine solutions.

In the field of new methods and products, progress was reported in the production of synthetic fibers resembling wool from casein, the utilization of whey in producing lactic acid, the use of whey powder and whey cream in the prepara-

tion of various food products, the use of special paper bags for storing milk powders, partial dehydration and low temperature storage as a method of preserving milk over long periods, and methods for the successful manufacture of Bel Paese, Swiss, and Roquefort type cheeses and for canning natural Cheddar cheese.

[Investigations with dairy cattle and dairy products in Texas] (*Texas Sta. Rpt. 1935, pp. 120, 121, 122*).—Dairy cattle investigations reported include the feeding value of ground v. whole grains, by A. L. Darnell and O. C. Copeland; cottonseed meal and hulls as a ration for lactating dairy cows and the minerals necessary in commercial dairy feeds, both by Copeland; the vitamin A requirements for milk production and maintenance of dairy cows, by G. S. Fraps and Copeland; and permanent pastures in east central Texas, by Copeland, B. L. Warwick, and E. B. Reynolds.

Cottonseed meal ration and silage versus herd ration, hay, and silage, R. H. Lush (*Louisiana Sta. Bul. 278 (1936), pp. 7*).—In the first of the experiments reported two simple grain feeds containing 75 parts of ground yellow corn plus 25 parts of cottonseed meal and 75 parts of ground yellow corn plus 25 parts of soybean oil meal, respectively, each supplemented with 2 percent of oystershell flour and 1 percent of salt were fed as the concentrate ration to groups of Holstein heifers throughout their growing period and during their first and second lactations. Roughage in each case was supplied as corn-soybean silage in winter and by pasture throughout the grazing season. No significant differences were noted in the results obtained from these two rations, each supporting growth gains of approximately 1 lb. per day to time of first freshening and each maintaining excellent milk production through the two lactation periods. When compared with a group of young cows on a more complex grain mixture of ground corn, oats, wheat bran, and cottonseed meal and salt with mixed grass and legume hay and corn-soybean silage as a roughage, and making allowance for apparent hereditary differences in the productive ability of the respective groups, the cows on the simple ration averaged 20.3 percent more fat-corrected milk than the latter group.

In a series of comparative trials by the reversal method, the corn-cottonseed meal-silage ration proved slightly superior to a mixed grain-dehydrated soybean hay-silage ration and only slightly inferior to mixed grain-dehydrated alfalfa hay-silage rations.

It is concluded that under the conditions outlined legume hay and a bulky grain ration are not necessary for economical production when silage or pasture, corn, cottonseed meal, and an adequate supply of minerals are fed.

Growth and development of dairy calves on a milk diet, H. A. Herman (*Missouri Sta. Res. Bul. 245 (1936), pp. 102, figs. 37*).—In this experiment three Holstein heifer calves were reared on an unsupplemented whole milk diet and five similar calves on whole milk supplemented with iron, copper, manganese, and cod-liver oil.

All calves made supernormal growth during the early growth stage, and at 6 to 10 mo. of age they were about 20 percent above normal in body weight. During this period, in which food consumption was normal, the computed gross energetic efficiency was above normal. The calves receiving unsupplemented milk showed evidence of anemia after 6 mo. of age, closely followed by loss of appetite, difficult breeding, and physical weakness. These calves died at 323, 391, and 528 days of age, respectively. The calves receiving supplemented milk did not show evidence of anemia at any time, but at about 10 mo. of age began to show loss of appetite, followed by loss in weight, dyspnea, and physical weakness, and died at 333, 340, 373, 388, and 404 days

of age, respectively, in general surviving only about 1 mo. longer than calves on the sole milk diet.

All calves maintained normal blood values for calcium, phosphorus, and magnesium, and none developed tetany. Bone development was adjudged normal in all cases, although the group receiving cod-liver oil had slightly denser bones. The energy metabolism of both groups tended to be above normal, particularly after 6 to 8 mo. of age, when the calves were dyspneic, nervous, and irritable. The most prevalent post-mortem findings were hemorrhages of the kidney, lung, thymus, and heart, enlargement of the thymus, degeneration of the heart muscles, underdeveloped digestive organs, except the abomasum, and catarrhal condition and ulcerous areas in the pyloric end of the abomasum and the duodenum. No abnormalities were noted in the histological examination of various tissues. Death of the calves on the sole milk diet was attributed to anemia and of those on supplemented milk to a dietary deficiency, although the exact nature of this deficiency remains obscure.

Amounts of feed and labor used in raising dairy heifers, H. O. Henderson, G. A. Bowling, and L. F. Herrmann (*West Virginia Sta. Bul. 277 (1936), pp. 27, figs. 10*).—This bulletin presents a summary of material obtained from two sources, (1) the feed consumed and labor required to grow Jersey and Holstein heifers to 2 yr. of age in the station herd, and (2) the estimated feed consumption and labor requirements for growing dairy heifers to 2 yr. of age based on a survey of 122 farms in different parts of the State. Extensive data on total feed and total digestible nutrients consumed, growth rates, a comparison of spring- and fall-born heifers, and the labor required at different seasons and for different sized herds are presented in tabular and graphic form.

Based on whole milk at $2 and skim milk at 50 ct. per hundredweight, grain at $26 and hay at $15 per ton, pasture at $1 per head per month, and labor at 15 ct. per hour, the feed and labor costs for raising station Holstein heifers, station Jersey heifers, and West Virginia farm heifers to 2 yr. of age were found to be $103.17, $94.61, and $73.21, respectively.

A convenient method for obtaining bovine arterial blood, W. R. Graham, Jr., H. D. Kay, and R. A. McIntosh (*Roy. Soc. [London] Proc., Ser. B, 120 (1936), No. 818, pp. 319–329, fig. 1*).—This contribution describes a technic for obtaining samples of arterial blood from the internal iliac artery per rectum simultaneously with the collection of venous blood from the mammary vein. The suitability of this technic in obtaining blood samples for experimental study of the possible precursors in blood of the milk constituents is discussed.

The precursors in cows' blood of milk fat and other milk constituents, W. R. Graham, Jr., T. S. G. Jones, and H. D. Kay (*Roy. Soc. [London] Proc., Ser. B, 120 (1936), No. 818, pp. 330–346, figs. 3*).—Employing the technic described above, simultaneous samples of arterial and venous blood were drawn from lactating cows. By determining the concentration of cholesterol, phospholipin, phosphoric esters, fatty acids, inorganic phosphorus, and blood sugar in the two samples and determining the reduction in concentration of these constituents after the passage of blood through the mammary gland, certain tentative conclusions were reached relative to the precursors in the blood of various milk constituents.

The fat of cows' milk is derived primarily from the nonphospholipin fatty acids of the blood, probably those of neutral fat, although the cholesterol esters may also be involved. Phosphorus compounds of milk are derived largely from the inorganic phosphorus of the blood plasma. The phospholipin content of the blood is not noticeably affected by its passage through the mammary gland, indicating that it plays little part as a precursor of either milk fat or

milk phosphorus. Marked quantities of sugar disappear from the blood during its circulation through the mammary gland, the percentage varying with the sugar concentration of the blood and also with the volume of milk secreted.

It is shown that the volume of blood required to produce a volume of milk is of the same order whether based on the fatty acid change, inorganic phosphorus change, or sugar change of blood during its passage through the udder. There is definite evidence of a very rapid circulation of blood through the udder of heavy-producing cows, estimated to be of the order of 1.25 gal. of blood per minute for a cow yielding 4 gal. of milk per day.

The effect of thyroxine on milk secretion and on the phosphatase of the blood and milk of the lactating cow, S. J. Folley and P. White (*Roy. Soc. [London] Proc., Ser. B, 120 (1936), No. 818, pp. 346–365, figs. 10*).—The observation that the blood serum phosphatase of individual dairy cows varied quite widely led to this investigation. Four cows weighing from 562 to 600 kg each and from 13 to 24.5 weeks advanced in lactation were given daily subcutaneous injections of 10 mg of thyroxin over a 15-day period, the experimental period being preceded and followed by an 8-day normal control period.

The thyroxin treatment caused some increase in serum phosphatase, although not enough to justify the conclusion that differences in the level of plasma phosphatase among individual cows is due to differences in thyroid activity. In each instance thyroxin caused a pronounced increase in milk yield and at the same time an increase in the percentage of fat and solids-not-fat in the milk, but resulted in a sharp decline in the production of phosphatase in milk, this reduction being most pronounced in milk having the highest initial concentration. No evidence obtained in the study indicates that milk phosphatase is derived directly from that in the blood serum. Immediately following the injection period, milk yield, milk phosphatase, serum phosphatase, and serum inorganic phosphorus declined to subnormal levels, probably due to the fact that normal thyroxin activity was depressed during the period of thyroxin injection and required some time to return to normal.

The reduction of methylene blue at 15.5° C (60° F) as a test of keeping quality of milk, A. L. Provan, F. J. Dudley, and S. B. Thomas (*Welsh Jour. Agr., 12 (1936), pp. 130–135*).—When the methylene blue reduction test was carried out in stoppered tubes, incubated at 15.5° and shaken twice daily, a rather close agreement was noted between the reduction time and the time required to develop taints to off flavors in the milk. When evaluated to the nearest half day the reduction time is somewhat less than that required for development of off flavors, up to the seventh half-day period, but beyond this the reduction time is greater than the directly observed keeping quality. This condition is attributed to the presence of bacteria other than lactic acid types, which develop off flavors without acid production, and the accompanying decrease in the reduction oxidation potential in the milk.

Bottled concentrated whole milk, P. H. Tracy (*Amer. Creamery and Poultry Prod. Rev., 82 (1936), No. 8, pp. 258, 259*).—This article from the Illinois Experiment Station briefly discusses bottled concentrated whole milk from the standpoint of its keeping quality and flavor and consumer reactions to this product. Certain factors relating to the possible future expansion of marketing milk in this form are pointed out.

The evaporation and spray systems of cooling cream, W. H. Martin, W. J. Caulfield, and A. C. Fay (*Kansas Sta. Circ. 180 (1936), pp. 16, fig. 1*).—Data are presented on the relative effectiveness of these two simple methods of cooling cream which are commonly employed on the farm and in cream-receiving stations.

The efficiency of the evaporation or wet sack method is not materially affected by the type of cloth used for wicking. The degree of air circulation and the relative humidity and temperature of the atmosphere as well as the initial temperature of the cream affect the rate of cooling, while room temperature and relative humidity largely determine the ultimate attainable temperature. Average room temperatures of 85°, 86°, and 98° F. at relative humidities of 49, 69, and 33 percent result in can temperatures (cooled by evaporation) of 70°, 78°, and 75°, respectively. The efficiency of the spray method of cooling is primarily dependent upon the temperature of the water and the volume of water delivered per unit of time. The use of sack coverings did not increase the efficiency of this method, indicating that evaporation plays a relatively small part in spray cooling. Sour cream, due to its greater viscosity, cools more slowly and less uniformly that sweet cream unless agitated frequently during the cooling process.

Rate of temperature change in butter packed in boxes of different types, F. H. McDowall (*New Zeal. Jour. Sci. and Technol., 17 (1936), No. 5, pp. 666–673, figs. 5*).—This study deals with the relative insulating effect of standard butter boxes (⅝-in. ends, ½-in. sides, top, and bottom), substandard boxes (⅝ by ⅝ in.), and wire-bound boxes (¼-in. material throughout) as determined by the rate of rise in butter temperature when lots of butter in each type of container were removed from frozen storage and exposed to room temperature of about 69° F.

A pronounced lag was noted in the temperature rise on the butter surface, due to the greater insulating effect of the thicker box material. It is concluded that under best conditions of transportation this difference would be of doubtful value, but that under less favorable transport conditions the thicker boxes would prove a valuable safeguard to the quality of the packed butter.

The application of the catalase test to butter, G. Cruess-Callaghan (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1936), No. 28, pp. 253–255*).—The author has made a statistical analysis of the data previously published by other investigators regarding the relation between the catalase test on butter samples and either the quality score or the keeping quality of the butter.

A correlation of −0.4 between the catalase value and the quality score of butter is shown, while the correlation between catalase test and keeping quality was of the same order. These findings are of particular interest in view of the fact that other workers have shown correlations ranging from 0.191 to −0.96. The apparent reasons for such wide variations are pointed out.

Bacteriological studies on musty flavour in butter, H. H. Randell (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 1, pp. 23–26*).—A study of the butter defect known as musty flavor indicates that a specific, previously undescribed species of the genus *Achromobacter* is the causative bacterium. The morphology and cultural characteristics of the organism are described. Improperly sterilized wooden utensils, water hose, and the water supply are listed as probable sources of contamination for this organism.

VETERINARY MEDICINE

[Work in animal pathology by the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 19, 39–41*).—The following work in animal pathology in 1935–36 is briefly reported upon (E. S. R., 75, p. 252): Mineral deficiencies and nutritional diseases, particular reference being made to intoxication by timber milkvetch (*Astragalus campestris*), an account of which has been noted (E. S. R., 75, p.

539); losses of lambs and of sheep; Bang's disease; equine encephalomyelitis; and oat-hay poisoning.

[Work in animal pathology and parasitology by the Texas Station] (*Texas Sta. Rpt. 1935, pp. 13–18, 22, 120, 234–240*).—The work of the year with livestock affections (E. S. R., 75, p. 102) briefly reported includes loin disease of cattle, infectious bovine abortion, stomach worms (trichostrongyles) in sheep and goats, anaplasmosis, miscellaneous poisonous plants, hard yellow livers in sheep and cattle, sheep losses in the feed lot, chronic nephritis in cattle and sheep, and a further outbreak of the new disease in cattle reported upon the preceding year, all by H. Schmidt; stomatitis and laminitis in sheep, by F. P. Mathews; locoweed poisoning, by G. S. Fraps and E. C. Carlyle; Bang's disease, by Schmidt and O. C. Copeland; and at the Sonora Substation the toxicity of bitterweed (*Actinea odorata*), by I. B. Boughton and W. T. Hardy, hard yellow livers of sheep and cattle, by Boughton, Hardy, and V. L. Cory, contagious ecthyma (sore mouth) of sheep and goats and stomach worms (*Haemonchus contortus*) of sheep and goats, both by Boughton and Hardy, and feeding trials of poisonous plants.

Selective habitat of the poisonous Astragalus hylophilus (Rydg.) A. Nels., O. A. Beath (*Ecology, 17 (1936), No. 4, pp. 692–694*).—The finding in Wyoming that *A. hylophilus* (*A. campestris* Gray), known as timber milkvetch, is restricted in growth to soils derived from the Hanna and Bishop conglomerates and may be taken as a plant indicator of these geological formations in situ, is reported. The increased activation of the toxic principle or principles in *Astragalus* spp. caused by the toxic element selenium, first reported by Beath and his associates in 1934 (E. S. R., 72, p. 251), does not occur in *A. hylophilus*. The pathology of affected animals points definitely to a toxic mineral activation. Tin, molybdenum, and arsenic in organic combination have been isolated from plant extracts. In addition to its selective soil preference it has another unique habitat in that its occurrence in areas within the Hanna and Bishop conglomerates is quite generally confined to aspen growths, aspen-pine associations, and pines. Under suitable soil and moisture conditions the continuity of growth is so persistent that the ground frequently is more or less completely covered by it.

It is a poisonous plant particularly troublesome to livestock men in south-central and southwestern Wyoming (E. S. R., 67, p. 738).

Tissue culture studies on bacterial hypersensitivity, I–III (*Jour. Expt. Med., 64 (1936), Nos. 3, pp. 339–368, pls. 2, figs. 7; 6, pp. 943–951, pls. 2*).—This contribution is presented in three parts.

I. *Tuberculin sensitive tissues*, J. K. Moen and H. F. Swift (pp. 339–353).—In the studies here reported a high degree of cellular sensitivity to tuberculin toxicity was demonstrated when explants from tuberculous animals were grown in media containing that substance. "Similar degrees of sensitivity were noted in cells derived from animals infected with either virulent or relatively lowly virulent strains of tubercle bacilli. The specificity of the tuberculin cytotoxicity was proved by testing with other bacterial cytotoxic materials. Tuberculin sensitive cells grown in vitro in normal media showed, when tested with tuberculin, persistence of this cellular sensitivity through several transplantations, during which time many new generations of cells developed. There was a depression of the initial growth energy of explants from animals during the toxic phase of the disease. During the healing stage the initial growth energy returned to normal, although marked sensitivity to tuberculin persisted. The degree of cellular sensitivity to tuberculin in vitro did not parallel the acuity of the infectious process but represented a more or less

permanent acquired characteristic impressed on the cell as a result of the infection."

II. *Reactions of tissues from guinea pigs infected with group C hemolytic streptococci*, J. K. Moen (pp. 355–368).—It was found that "guinea pigs infected with naturally pathogenic hemolytic streptococci (group C—Lancefield) develop a low grade chronic type of disease characterized chiefly by purulent lymphadenitis. Cutaneous hyperreactivity to a crude streptococcal extract invariably occurred during the course of this infection. Production of antibodies (precipitins and agglutinins) was studied. The hemolytic streptococcal extract had a specific toxic effect, when tested in vitro, on cells from infected animals; this was shown by microscopic evidence of cellular injury and by quantitative inhibition of cellular migration and growth. The specificity of the reaction was proved by testing with other cytotoxic substances. There was no parallelism between skin hypersensitivity and humoral antibody titer. There was no correlation between the degree of skin reactivity to the bacterial extract and the degree of sensitivity of splenic cells to the toxic action of the same extract in vitro. Comparison of cellular sensitivity to tuberculin with cellular sensitivity to streptococcal extract in cultures of guinea pig tissues showed that the former was more intense and was more persistent on prolonged growth in vitro."

III. *The persistence in vitro of the inherent sensitivity to tuberculin of cells from tuberculous animals*, J. K. Moen (pp. 943–951).—"Mononuclear exudative cells obtained from tuberculous guinea pigs by the intrapleural injection of parowax exhibited characteristic sensitivity to the toxic action of tuberculin when tested in tissue culture. Experiments with these cells, practically free of body fluids, show conclusively that sensitivity to tuberculin is an inherent characteristic of mesenchymal cells from tuberculous animals. Fibroblastic growths which developed from mononuclear exudative cells derived from a tuberculous animal showed persistence of sensitivity to the toxic action of tuberculin on repeated transplantations over a prolonged period in vitro."

Immunization against anaplasmosis and piroplasmosis, T. Topacio (*Philippine Jour. Anim. Indus., 3 (1936), No. 3, pp. 169–179*).—Following a brief introduction, a review of the literature, and descriptions of materials and methods, three experiments are reported, one consisting of immunization by single infection (*Anaplasma* group), one by double infection (*Piroplasma-Anaplasma*), and one by single infection (*Piroplasma*). The information gained from the first would indicate that the subcutaneous and intravenous inoculation of blood from *Anaplasma* carriers in doses of varying amounts gives satisfactory results in Batangas calves. The second experiment showed that the subcutaneous and intravenous inoculation of carrier blood containing both infections into susceptible Batangas calves even at a low dose of 5 cc was still too severe for purposes of immunization. The third experiment indicates that the ideal method of immunizing against piroplasmosis is by the use of blood obtained when the red cells showed the bigeminal forms of the parasites and injecting 2 to 3 cc of such blood.

It is concluded that the ideal method of protection consists in immunizing against the first disease and after complete recovery against the second according to the method employed in the third experiment.

The size of the virus of Aujeszky's disease ("pseudo-rabies", "infectious bulbar paralysis", "mad-itch") by ultrafiltration analysis, W. J. Elford and I. A. Galloway (*Jour. Hyg. [London], 36 (1936), No. 4, pp. 536–539*).—In the experiments reported, broth suspensions of brain or lung tissue from rabbits in advanced stages of Aujeszky's disease were analyzed by fractional ultrafiltration through graded collodion membranes with a view to estimating

the size of the virus particles. The virus was found to have a particle size of 100–150 mμ. Two strains were employed in these experiments, one that of Aujeszky (E. S. R., 14, p. 707) and the other Shope's mad-itch strain (E. S. R., 65, p. 872). The results with both strains were identical.

Rabies among hematophagous bats (Desmodus rotundus murinus) [trans. title], S. TORRES and E. DE QUEIROZ LIMA (*Rev. Dept. Nac. Prod. Anim. [Brazil], 2 (1935), No. 4–6, pp. 385–405, figs. 10; Eng. abs., pp. 394, 395*).—The authors find that naturally or when experimentally infected bats can resist the rabies infection, becoming carriers and eliminators of the virus with which they inoculate the animals they attack to suck the blood. Hematophagous bats, when infected, disseminate the virus among themselves and can transmit it to bats not hematophagous. The salivary glands are viruliferous, but the virulence does not always coincide with that of the brain and vice versa. The results observed indicate that the rabies virus, after having passed through the central nervous system, can remain and probably ends in the salivary glands.

The utilization of sheep in the rabies vaccine protection tests, J. E. SCHNEIDER (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 6, pp. 671–676*).—The use of the intralingual method of administering the infective dose of rabies virus has given consistent results in the protection test of rabies vaccine on rabbits. The results on sheep have shown that the method is suited for this type of protection test. "It has been shown that rabies vaccine A, containing 25 percent rabbit brain and cord tissue, protected rabbits in a single 5-cc dose or in 14 doses of 0.5 cc each at daily intervals. The tests also show that rabies vaccine B, containing 20 percent horse brain and cord tissue, protected rabbits equally as well as the rabbit vaccine A in the group injected with 14 doses of 0.5 cc each at daily intervals. The group of rabbits injected with a single 5-cc dose of vaccine A were 100 percent protected, whereas with vaccine B one rabbit out of six died. Rabies vaccine B, containing 20 percent horse brain and cord tissue, showed a high degree of protection in each of the three groups of sheep."

Further studies on Fascioloides magna (Bassi 1875) Ward 1917 as a parasite of ruminants, W. E. SWALES (*Canad. Jour. Res., 14 (1936), No. 8, Sect. D, pp 83–95, pls. 3*).—A report is made of comparative studies (E. S. R., 73, p. 100) of the tissue reactions in fascioloidiasis magna in *Bos taurus, Bison bison, B. taurus × B. bison, Cervus canadensis, Odocoileus virginianus,* and *Ovis aries.* The data support the hypothesis that the Cervidae are normal hosts in the trematode's life cycle, that the large Bovidae do not act in this capacity, and that *O. aries* may act as a definitive host but is severely injured by even light infestations. The cellular bases of the defense reactions in the above ruminants are recorded.

Johne's disease in Victoria, H. E. ALBISTON and R. J. DE C. TALBOT (*Austral. Vet. Jour., 12 (1936), No. 4, pp. 125–138*).—Johne's disease does not appear to be a serious problem in Australia at the present time, Victoria being the only State in which it has become established. In the 17 yr. since its recognition in that State, it has extended to only 13 properties. The history of its occurrence in each of these herds is reported upon.

Morphological and chemical studies of the blood of cattle in health and during anaplasmosis, C. W. REES and M. W. HALE (*Jour. Agr. Res. [U. S.], 53 (1936), No. 7, pp. 477–492, fig. 1*).—In studies of anaplasmosis the only significant changes from normal that could be measured were those resulting directly or indirectly from the destruction of the blood cells of the host by the causative agent of the disease. The red blood cell count was greatly reduced, with a consequent reduction in the hemoglobin and the oxygen content and

oxygen carrying capacity of the blood. The carbon dioxide content of whole blood and of serum was only slightly reduced. The overloading of the blood stream with cellular debris produced a bilirubinemia that was detectable by the direct Van den Bergh reaction. The white cell count showed a leucocytosis involving a relative monocytosis; and a neutrophilia with a shift to the left (Shilling's formula), but, on the other hand, there was an eosinopenia. The total proteins, urea, sugar, phosphorus, and calcium of the blood were not measurably altered from the normal.

One thousand cows testing suspicious (1 : 50) to the Bang agglutination test and their subsequent test behavior, C. H. Kitselman (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 6, pp. 678–680*).—Work with Bang's disease by the Kansas Experiment Station extending over a period of 5 yr. is reported. "At the expiration of 5 mo., 60.1 percent of the cattle which had reacted in a dilution of 1 : 50 had become definitely negative to the test and 23.1 percent had become definitely positive in a dilution of 1 : 100 or higher, whereas 16.8 percent remained unchanged in the suspicious classification. Approximately 41.6 percent of the suspicious animals on the initial test were in the group of herds having 17.9 percent infection, 23.3 percent were in the group having 17 percent infection, 22 percent were in the group of herds having 12.3 percent infection, and 13.1 percent were in the group showing 10.1 percent initial infection. It seems, therefore, that practically all animals found to be reactors in a dilution of 1 : 50 on the initial test will definitely become either negative or positive within a period of 9 mo., and many within a period of 5 mo. These data may be of use in advising herd owners regarding the disposition of certan animals which react in the 1 : 50 dilution when the herd test history is available."

About the relation existing between the gaseous oedema and the diseases that cause the anemia, with special regard to piroplasmosis and anaplasmosis, A. Braga and A. Martins (*Rev. Dept. Nac. Prod. Anim. [Brazil], 2 (1935), No. 4–6, pp. 263–305, figs. 4; Eng., Fr. abs., pp. 289–296*).—The authors report that "three times cases of gaseous gangrene in bovines submitted to premunition against *Piroplasma bigeminum* and *Anaplasma marginale* were registered. There is some predisposition to the anaerobic infection in the cases of pneumopathia, cachectic diseases, and in the hemoparasitoses. In all the cases the *Clostridium oedematis-maligni* was isolated, identified by its morphological, cultural, biochemic, serological, and immunological properties.

"We must attribute the occurrence of the cases of gaseous gangrene in bovines during the period of immunization against the plasmoses: (1) First, to a predisponent cause—anemia and bad oxygenation of the tissues, by the deficiency of red globules, oxygen vehicles; (2) second, to the frequent inoculations by the parenteral vine; (3) finally, to the infection of intestinal origin, as the *C. oedematis-maligni* is an ubiquitous germ, easily absorbed with the food, and the water, becoming a saprophyte of the intestines, specially of the herbivorous intestines.

"Although they had been vaccinated against the symptomatic anthrax, there were suspicions that the *C. chauvoei* [sic] might have caused the cases of death [the etiological identification being urgent]. The test in guinea pigs, protected with the monospecific sera, and 24 hr. later inoculated with the material to be identified, is very practical. After the germ had been identified, 60 cc of anti-*C. oedematis-maligni* serum were individually inoculated in nearly 80 bovines, no more cases being registered. Before this the illness invaded largely, as in the preceding years.

"The tests of agglutination and of fixation of the alexin are two means that can help the identification of the anaerobe germs, but certain technical cares should be taken. In the premunition against the plasmoses it is better to

use attenuated infested blood, as we actually do, so that a slight reaction might prevent our intervention with injectable drugs. Caffeine and adrenaline, specially the latter, which is ischemiant, should be given per os, when their use should be advisable.

"The biochemic differentiation between the *C. chauvoci* and the *C. oedematis-maligni* lies in the fact that the former ferments saccharose and does not act on salicin, while the latter ferments both of them. Nevertheless, some authors mention strains of *C. oedematis-maligni* that do not ferment saccharose (type II) and others that ferment it (type I). Thus classifying, the germs we isolated would be of type I."

Experiments on the infectivity for healthy calves of bovine tubercle bacilli discharged in dung upon pasture.—I, From tubercular calves fed with emulsions of tubercle bacilli 1934–5; II, From tubercular cows passing tubercle bacilli in their dung 1935–6, E. C. G. MADDOCK (*Jour. Hyg.* [*London*], *36* (*1936*), *No. 4*, *pp. 594–601*).—The experiments reported show clearly that the pasture land must have been heavily infected with tubercle bacilli which at the time of their deposition were virulent when introduced subcutaneously into guinea pigs. "For 42 days after deposition, the dung of the infecting cow was shown to contain living tubercle bacilli, but by the technic used their survival was shown to be of comparatively short duration compared with the survival times shown for artificially infected dung. It is possible that mere numbers may account for the difference. The area used for the experimental grazing was only two-elevenths of an acre, and the weight of infection must have been far heavier than would normally take place on a farm. In spite of this fact none of the experimental healthy calves was shown to be infected. It seems, therefore, that in pasture which has been previously naturally infected, so long as no contact with the infecting animals is possible healthy animals may be expected to escape infection from this source. It therefore appears that the danger of infection being picked up from pasture manured with farmyard manure is remote. The most likely mode of spread of the disease is by contact of animal with animal either in the open or in cowsheds."

The control of black disease by vaccination, A. L. ROSE (*Austral. Vet. Jour.*, *12* (*1936*), *No. 5*, *pp. 185–189*).—The use of the vaccine proposed by Turner in 1930 (E. S. R., 63, p. 874) over three successive seasons indicates that this method of controlling enterotoxemia in cross-bred lambs bred for the fat market is of outstanding value.

Infectious necrotic hepatitis (black disease) control, with special reference to vaccination: With a note on vaccination against entero-toxaemia and black leg, R. N. WARDLE (*Austral. Vet. Jour.*, *12* (*1936*), *No. 5*, *pp. 189–192*).—Liver fluke control by snail eradication and carbon tetrachloride treatment of sheep, combined with the limiting of the spread of *Clostridium oedematiens* by the burning of carcasses, offers a means whereby infectious necrotic hepatitis can be controlled on many properties. Vaccinations have proved so effective as a means of control that losses can be greatly reduced in this way on properties where fluke eradication is impracticable.

The control of black disease, blackleg, and entero-toxaemia in Tasmania, W. G. BENNETT (*Austral. Vet. Jour.*, *12* (*1936*), *No. 5*, *pp. 192–196*).—A report on control work in Tasmania.

The control of entero-toxaemia of sheep, H. W. BENNETTS (*Austral. Vet. Jour.*, *12* (*1936*), *No. 5*, *pp. 196–200*).—Experimental data and field evidence are said to indicate that active immunization with *Clostridium ovitoxicum* anaculture provides a safe, efficient, and economical method of protection.

Further studies on the pathogenic importance of Chabertia ovina, G. Kauzal (*Austral. Vet. Jour., 12 (1936), No. 3, pp. 107–110*).—In the course of the experimental work here reported, the author confirmed earlier findings that *C. ovina* may lead to serious intestinal derangement and interference with growth in lambs.

"In the case of daily infestations with small numbers of larvae over a long period severity of the symptoms was not proportional to the rate of infestation. Evidence was obtained that immature *C. ovina* ingest considerable quantities of blood. Effects which would probably have proved fatal were induced only on one case, where heavy infestation with *C. ovina* was superimposed on a preexisting infestation with *Trichostrongylus* spp. It was not possible to set up other than light and fleeting infestations with the adult parasite, and factors other than those controlled in this experiment appear necessary for the establishment of heavy infestations with the adult worm. The specific effects due to the adult parasite have, therefore, not been studied."

Salmonella onderstepoort: A new type of Salmonella from a sheep, M. W. Henning (*Jour. Hyg. [London], 36 (1936), No. 4, pp. 525–531*).—During the course of the investigation of *Salmonella* infection in animals in the Union of South Africa the author encountered two strains that had been isolated from sheep at Onderstepoort. The antigenic structure of one corresponded fully with that of *S. typhimurium*, while the other was found to represent a new type possessing serological characteristics not hitherto described, for which the name *S. onderstepoort* is proposed.

Studies in tick-borne fever of sheep.—II, Experiments on transmission and distribution of the disease, J. MacLeod (*Parasitology, 28 (1936), No. 3, pp. 320–329*).—In continuation of the studies previously noted (E. S. R., 69, p. 590) it was found that female castor-bean ticks which feed on a sheep infected with tick-borne fever are not capable of transmitting the infective agent to their progeny. "Only the nymphs and females, therefore, can be infective to sheep. In the case of an infective female, the infection may have been acquired (1) in the immediately preceding stage, or (2) in the larval stage, the infective agent remaining in the tissues of the tick during the nymphal engorgement and subsequent molt. This appears to occur irrespective of whether the host on which the nymph feeds is a susceptible or an insusceptible animal.

"Ticks which have acquired infection are infective as soon after molting to the next stage as they are able to attach to hosts. Unfed ticks were not found to be infective after a period of about 14 mo. Infection is transmitted to the sheep in the course of the second day after attachment of infective nymphs. The disease may be transmitted to sheep by inoculation of emulsions of infective ticks, if these have been allowed to commence engorgement. The use of saline for such emulsions appears to be inadvisable."

The effect of carbon tetrachloride on sheep, H. C. Kennan (*Austral. Vet. Jour., 12 (1936), No. 4, pp. 150–153*).—In a study of the effect of the continuous administration of carbon tetrachloride to sheep in combating the liver fluke (*Fasciola hepatica*), experiments were conducted which have shown the administration of 1 ml or 5 ml at intervals of 2 weeks or 1 mo. for a period of 10 mo. to result in a satisfactory growth and without producing any recognizable ill effects. On post-mortem examination there was no evidence of any damage to the liver, and the flesh was not affected as regards toughness or palatability. Old fluke-free sheep drenched (1) fortnightly or (2) monthly with either 1 ml or 2 ml of carbon tetrachloride for 10 mo. suffered no ill effect, and on post-mortem examination no damage to liver could be detected. Pregnant ewes drenched monthly with 2 ml during the last 4 mo. of the gestation period, and

thereafter for another 4 mo., lambed and raised their lambs without showing any ill effects from the treatment.

Medicinal treatment of trichostrongylosis: Efficiency in lambs exposed to continuous infection, H. McL. Gordon and I. Clunies Ross (*Austral. Vet. Jour., 12 (1936), No. 3, pp. 111-113, fig. 1*).—In the experiments conducted, "sheep exposed to daily infection with 4,000 *Trichostrongylus* spp. did not develop trichostrongylosis and made satisfactory weight gains when treated with an appropriate dose of a 2-percent solution of copper sulfate and commercial nicotine sulfate. Sheep similarly exposed to infection, but treated with copper sulfate followed by tetrachlorethylene, appeared also to receive a high degree of protection. All sheep not treated medicinally with either of the above combinations of drugs succumbed to trichostrongylosis in from 70 to 141 days. Increasing the resistance of animals to *C[lostridium] ovitoxicus* does not modify the disease under experimental conditions."

A contribution to the study of brucelliasis of swine [trans. title], O. Prosoo, E. Hardman, and J. Bifone (*Folha Vet., 1 (1936), No. 5, pp. 70-79; Eng. abs., p. 79*).—In the course of abattoir inspection the authors have observed the presence of nodular and caseous lesions in the spleen of swine without involvement of the lymphatic system as is observed in tubercular infection. *Brucella* agglutinins were found in two cases, and cultures of the germ were obtained from the spleen lesions. Twelve strains of *B. suis* were isolated from 50 cases, the typing of the organism having been made by the dye method.

Serial passage of hog cholera virus in the guinea pig, with a resulting loss of virulence for the hog [trans. title], F. LeChuiton, C. Mistral, and J. Dubreuil (*Compt. Rend. Acad. Sci. [Paris], 202 (1936), No. 1, pp. 96-98, fig. 1*).—The hog cholera virus was passaged through guinea pigs by intratesticular inoculation. After a continued passage the virus became adapted to the guinea pig and lost most of its virulence for swine.

Crystal-violet vaccine for the prevention of hog cholera.—Progress report, C. N. McBryde and C. G. Cole (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 6, pp. 652-663*).—In the work reported, 63 lots of vaccine were prepared with crystal violet dye by several methods and tested on a total of 271 pigs, the vaccine-treated pigs being exposed to hog cholera by virus injection. Of these, 266 proved to be adequately protected against hog cholera. The injection of virus caused a slight reaction in about 9 percent of the treated animals. This reaction, which occurred as a rule between the fourth and eighth days and lasted only 2 or 3 days, was followed by a quick return to normal. The reaction was usually so slight that it would have escaped notice in most cases but for the fact that each animal was carefully watched at feeding time. In one farm experiment in which 40 shotes weighing from 50 to 90 lb. were given 10 cc each of vaccine, half of the herd having been exposed later by virus injection after the animals had attained a weight of from 200 to 250 lb., all were found to be adequately protected against hog cholera. From 2 to 3 weeks seem to be required for the immunity to become established. The duration of the immunity following vaccine treatment has not been established, but was found to be at least 6 mo.

Resistance of the Berkjala breed of swine to hog cholera, M. Manresa and M. Mondoñedo (*Philippine Agr., 25 (1936), No. 3, pp. 214-220, figs. 2*).—The origin of the Berkjala breed, a cross of the purebred Berkshire and the native Jalajala breeds of swine, is discussed. In the building up of this breed of swine selection for resistance against disease was not overlooked, and it is believed that much progress in the development of a strain of pigs of high resistance against hog cholera has been shown by the data presented.

Practical methods of control and eradication of kidney-worm disease of swine, Z. de Jesus (*Philippine Jour. Anim. Indus., 3 (1936), No. 4, pp. 295–305, fig. 1*).—Three practical methods of control and eradication of the kidney worm (*Stephanurus dentatus* Dies.) disease of swine are described and reported. Kidney worm-free pigs could be produced from infested sows by applying any one of the three methods described, thus eradicating the kidney worm infestation among the first generation of pigs.

"In order to avoid long exposure of the kidney worm-free pigs to the infested sows, after 8 weeks the litters should be separated; and, in order to prevent subsequent infection, the weanlings should be raised in uninfested hog pens and pastures. Kidney worm-free premises are either those which had not been previously occupied by any swine, had been only used by kidney worm-free pigs, or had been vacated for about 4 mo. In each of the three methods, strict observance of sanitation is imperative. . . .

"Despite the fact that during the gestation period the sows were constantly exposed to infection, there was no case of intrauterine infection; showing that, if this mode of infection ever takes place in stephanuriasis, it may be only in very rare cases. In the control experiment where the suckling pigs were exposed to natural infection soon after birth, gravid female worms were found in the perirenal fat and the urine was positive for ova of kidney worm of pigs ranging in ages from 134 to 146 days. Hence, it is quite conclusive that, due to the tenderness of the tissues of the suckling pigs, the development and the migration of the kidney worms in the bodies of the young hosts were faster than in older pigs.

"In view of these findings, the fact is established that even pigs younger than 6 mo. old, when raised in infested hog pens without regard to sanitation, are as potentially dangerous as the older ones by acting as disseminators of the eggs of kidney worm."

A list of 22 references is included.

Habronemiasis, J. R. Underwood ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 30 (1936), No. 1, pp. 16–28*).—The author has found worms of the genus *Habronema* to be common parasites of Army animals in the United States and in the Philippine Islands. It is pointed out that "*Habronema* larvae, long known to be associated with summer sores in Europe and South America, are the common cause of summer sores in the Philippine Islands and in Texas. Habronemic conjunctivitis of the horse occurs in the United States and in the Philippine Islands. *Habronema* larvae are capable of penetrating moistened, unbroken skin. Examination of the stomach contents of 131 horses and mules failed to confirm the theory that *Habronema* larvae reach the stomach through the swallowing of infested flies. Glycerin combined with fly repellents is effective in the treatment of cutaneous habronemiasis."

Mercuric chloride test for infectious anemia, J. D. Derrick ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 30 (1936), No. 3, pp. 197–199*).—The author's study leads him to doubt if the mercuric chloride test is of definite diagnostic value for infections anemia of the horse.

Equine infectious anemia in New England, R. A. Kelser ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 30 (1936), No. 3, pp. 193–196*).—Cases are here reported which show that infectious anemia of horses has occurred and does occur in the New England States.

Report of an outbreak of equine infectious anemia, with observations on blood changes, C. A. Griffin and C. P. Brose (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 6, pp. 664–670, figs. 2*).—Clinical observations and laboratory findings during a small outbreak of equine infectious anemia in New York State

are reported. Attention is called to the fact that this disease is not always recognized and that it presents a serious problem to owners of large groups of horses. The changes in the blood and the time of their occurrence in relation to the elevation of temperature are reported upon.

[Equine dhobie itch a symptom of filariasis], J. R. U[NDERWOOD] ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 30 (1936), No. 1, pp. 71–77, figs. 2*).—These notes supplement the previous data (E. S. R., 74, p. 699).

Equine encephalomyelitis, J. D. DERRICK ([*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 30 (1936), No. 3, pp. 174–192*).—Experimental studies and observations of virus-borne epizootic equine encephalomyelitis are outlined. These comprise observations of symptoms, macroscopic and microscopic pathology, transmission experiments, and attempts at immunization and therapy with antiserum.

It is concluded that "the disease affects horses of all ages, regardless of physical condition. The virus is readily isolated from brains of affected horses before death, but appears in the blood stream only during the early febrile phase. Cultures from typical cases were sterile except for an occasional non-specific streptococcus. The symptoms are those of a progressive involvement of brain and spinal cord, usually of two types, the lethargic or excitable. Subcutaneous injections of virus did not result in consistent reproduction of the syndrome. Cisternal and epidural inoculations of spinal virus regularly reproduced the specific disease."

A report is made of the preparation of vaccines after the methods of Laidlaw-Dunkin and of Kolmer, and the simultaneous immunization of horses with specific antiserum and virus.

Epizoötic fox encephalitis.—VII, The occurrence of the virus in the upper respiratory tract in natural and experimental infections, R. G. and B. B. GREEN, W. E. CARLSON, and J. E. SHILLINGER (*Amer. Jour. Hyg., 24 (1936), No. 1, pp. 57–70, figs. 3*).—Further studies (E. S. R., 73, p. 244) have shown that "the virus of fox encephalitis can be identified in the upper respiratory tract by injection into foxes of filtered nasal washings. Using this technic, the natural spread of the disease was studied in a group of experimental red foxes. Following the initial spread of the infection, a second spread was occasioned by artificially increased contact. Subsequent to a closed serum-virus injection, the virus appeared in the upper respiratory tract of only those animals which developed delayed infections. All studies seem to show a high affinity of the virus for the upper respiratory tract. The specific inclusions of fox encephalitis were demonstrated in cells associated with the surface epithelium of the upper respiratory tract. In definite ulcers nearly all cells contained the inclusion bodies. It would seem evident that the upper respiratory tract is the portal of entry for the fox encephalitis virus, and that the virus gains entrance by direct involvement of surface cells. The development of virus in the upper respiratory tract after a closed intramuscular injection of the virus appears to be due to the involvement of surface epithelium as a part of the general infection. It is indicated that persistence of the virus in the surface cells of the upper respiratory tract is responsible for the carrier state which has been obvious in epidemiological studies."

Diseases of poultry, with special reference to those occurring in Cyprus, R. MOYLAN GAMBLES (*Cyprus Agr. Jour., 31 (1936), No. 1, pp. 12–19*).—The more important diseases and parasites of poultry in Cyprus are briefly considered.

The genus Capillaria Zeder 1800 [Nematoda, Trichuroidea] and the capillarioses in poultry, J. F. TEIXEIRA DE FREITAS and J. LINS DE ALMEIDA (*Rev. Dept. Nac. Prod. Anim. [Brazil], 2 (1935), No. 4–6, pp. 311–384, figs. 49; Eng. abs., p. 363*).—This contribution includes descriptions and the synonymy

of 10 species of *Capillaria* found in domestic fowl, a domestic host list, and a bibliography of 141 titles.

Laryngotracheitis, one of the poultry diseases previously called "roup", T. G. Hungerford (*Agr. Gaz. N. S. Wales, 47 (1936), Nos. 2, pp. 112–114, figs. 2; 3, pp. 163–165, figs. 3; 4, pp. 225–226, figs. 2*).—A summary of information is given on this disease of poultry, widespread in New South Wales and the cause of great economic loss.

A study of transmissible fowl leukosis, C. Olson (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 6, pp. 681–705, figs. 11*).—The author found fowl leucosis to be transmissible to susceptible chickens by means of whole blood, blood plasma, and tissue emulsions. "The inciting agent remains viable in glycerin solution and is filtrable. The disease is not transmissible to ducks, geese, or turkeys. The disease produced by the inciting agent is manifest by certain specific pathologic changes in the erythrocytic and granulocytic hematopoietic tissues, and in most instances by the appearance of pathologic cells in the peripheral blood. The transmissible agent of fowl leucosis is not responsible for the conditions known as lymphocytoma or neurolymphomatosis gallinarum. The changes in the blood in transmissible fowl leucosis are variable quantitatively and qualitatively. Transfusions with chicken blood and oral administration of arsenic in the form of Fowler's solution are of no avail in the treatment of the well established form of the disease."

Pullorum disease in captive quail, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 6, pp. 716, 717*).—An investigation was made by the Florida Experiment Station of losses which occurred throughout the 1936 growing season in young quail on a farm maintaining about 300 pairs of breeding birds. Cultures made from the organs of 2 of 5 affected quail chicks examined yielded a micro-organism having the characteristics of *Salmonella pullorum*. The infection appeared to have been introduced to the premises of the farm by birds raised in captivity that had been received in March, the infection having been spread to a considerable extent by means of the incubators. It is pointed out that while it is unlikely that pullorum disease is of particular importance in wild quail at this time, the release of pullorum-infected birds from quail farms is a potential menace to the future welfare of this game bird, particularly at this time, when the restocking of the wild supply is a conservation program of many States.

AGRICULTURAL ENGINEERING

Report of the Chief of the Bureau of Agricultural Engineering, 1936, S. H. McCrory (*U. S. Dept. Agr., Bur. Agr. Engin. Rpt., 1936, pp. 24*).—The progress results of investigations of duty of water, evaporation, silt in streams, pumping, underground storage, irrigation in the humid region, drainage of peat soils and sugarcane lands, curing concrete for resistance to alkali, farm-operating efficiency, heating of farmhouses, potato storage, cotton, corn, and sugar beet production machinery, combines for harvesting soybeans, a pyrethrum harvester, fertilizer-distributing machinery and practices, pest-control equipment, cotton gins, and drying seed cotton, conducted during the fiscal year 1936, are briefly presented.

[Agricultural engineering investigations by the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 24, 35–37, 38*).—Progress results are briefly presented of investigations on sugar beet machinery, the design and development of irrigation equipment, and irrigation water supply forecasting.

[Agricultural engineering investigations by the Texas Station], R. E. Dickson, B. C. Langley, H. P. Smith, D. T. Killough, D. L. Jones, B. H.

HENDRICKSON, R. W. BAIRD, and P. L. HOPKINS (*Texas Sta. Rpt. 1935, pp. 63, 64, 132–135, 152–156, 179–182, 199, 200*).—The progress results are briefly presented of investigations on mechanical harvesting of cotton, mechanical snapping of cotton bolls, factors of efficiency in the distribution and placement of cottonseed and fertilizer, calibration of cotton planters, planting of cottonseed at varying and uniform depths, run-off water losses in relation to crop production, and soil erosion control by agronomic and engineering methods.

Surface water supply of the United States, 1935, Parts 4, 7, 11, 13, 14 (*U. S. Geol. Survey, Water-Supply Papers 784 (1936), pp. 170, pl. 1; 787 (1936), pp. 150, pl. 1; 791 (1936), pp. 361, pl. 1; 793 (1936), pp 197, pl. 1; 794 (1936), pp. 167, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1935, No. 784 covering the St. Lawrence River Basin; No. 787, the lower Mississippi River Basin; No. 791, the Pacific slope basins in California; No. 793, the Snake River Basin; and No. 794, the Pacific slope basins in Oregon and lower Columbia River Basin.

Water levels and artesian pressure in observation wells in the United States in 1935, O. E. MEINZER and L. K. WENZEL (*U. S. Geol. Survey, Water-Supply Paper 777 (1936), pp. III+268*).—This report consists of a group of papers, prepared chiefly by members of the Geological Survey, relating for the most part to the work of the Geological Survey and cooperating Federal, State, county, and local agencies in obtaining records of water levels and artesian pressure in observation wells in 25 States and the Territory of Hawaii. It is planned to be the first of a series of annual reports on the fluctuations of the ground-water levels and artesian pressures in the United States.

Artesian water in the Florida peninsula, V. T. STRINGFIELD (*U. S. Geol. Survey, Water-Supply Paper 773–C (1936), pp. IV+115+195, pls. 11, figs. 9*).—This report is based on the results of a general survey, the essential data being presented largely in graphic form.

Ground-water resources of Kleberg County, Texas, P. LIVINGSTON and T. W. BRIDGES (*U. S. Geol. Survey, Water Supply Paper 773–D (1936), pp. II+197–232, pls. 5, fig. 1*).—This report presents the results of an investigation of the geology and ground water resources of the area.

Equipping a small irrigation pumping plant, W. E. CODE (*Colorado Sta. Bul. 433 (1936), pp. 55, figs. 25*).—Practical information of a technical character is presented on the subject, together with data on the cost of pumping. Appendixes give data on the economical sizes of pipe and on pump selection.

Application of rainfall intensity-frequency data, D. L. YARNELL (*Agr. Engin., 17 (1936), No. 9, pp. 386, 391, figs. 2*).—This is a brief discussion from the U. S. D. A. Bureau of Agricultural Engineering.

Subsoil waters of Newlands (Nev.) Field Station, C. S. SCOFIELD, C. L. MOON, and E. W. KNIGHT (*U. S. Dept. Agr., Tech. Bul. 533 (1936), pp. 31, fig. 1*).—The purpose of this report is to discuss conditions in respect to the subsoil water that constitutes one of the features of the problem of crop production not only on the Newlands Field Station but elsewhere on the Newlands reclamation project. The observations were made by means of a number of wells, 88 in all, comprised in 5 groups. The records include weekly observations of elevation in the wells of some groups and monthly observations in the others.

The saturated zone has a surface gradient to the south and east approximately conformable to the ground surface and equivalent to approximately 5 ft. per mile. The mean annual range in elevation from the low of early spring to the high of midsummer is somewhat less than 3 ft. The evidence of the water-elevation data indicates that the subsoil water is intercommunicating throughout the area of the field station, yet notwithstanding the

appreciable gradient of its surface there does not appear to be lateral movement in the mass at a measurable rate.

The salinity of the subsoil water has been determined by samples from the wells taken monthly or less frequently throughout the year. There are pronounced differences in the salinity of the water obtained from the different wells, and in general these differences remain fairly constant.

Changes in elevation of the subsoil water occur approximately simultaneously in adjacent wells, thus indicating hydrostatic intercommunication, but the persistent differences in salinity between adjacent wells indicate that there is a very slight general lateral movement of the water.

Observations have been made also on the salinity of the irrigation water and on that of the water collected by an open drain contiguous to the station. These observations show that the mean concentration of the subsoil water is from five to six times as high as that of the irrigation water, while the concentration of the drainage water is intermediate between these two.

Taken as a whole the evidence from these observations indicates (1) that the subsoil water is replenished in part by percolation from the unlined canals of the distribution system and in part by the downward percolation of the irrigation water applied to the land, and (2) that the lateral movement in the direction of the surface gradient of the saturated zone does not occur uniformly but rather through the more permeable sections of the subsoil.

The hydrostatic readjustments by which the seasonal changes in elevation are kept uniform appear to be transmitted through or around the less permeable sections of the subsoil and to be accomplished with very little movement in the mass of the subsoil water.

In some areas of the station the salinity and the boron content of the subsoil are so high as to retard or even to inhibit the growth of crop plants when this water invades the root zone of the soil.

Watershed and hydrologic studies in soil conservation, C. E. Ramser (*Agr. Engin., 17 (1936), No. 9, pp. 373–376, figs. 3*).—This is a brief discussion of these studies as they are being carried on by the U. S. D. A. Soil Conservation Service. Their objectives are (1) to determine the effect of erosion control practices and land use upon the conservation of water for agricultural purposes, such as irrigation and domestic farm supplies, and for public utility purposes, such as water power and urban water supplies; (2) to determine the effect of erosion control practices and land use upon the control of floods that destroy crops, damage soil fertility on agricultural bottom lands, and cause damage to or destruction of municipal property; and (3) to determine the rates and amounts of run-off and eroded soil material from rains of different amounts and intensities for use in the economic design of erosion control and flood control structures. This information will also be of value in determining to what extent eroded material can be prevented from entering and reducing the capacity of drainage channels and reservoirs by the application of proper land use and erosion control practices.

Sheet erosion studies on Cecil clay, E. G. Diseker and R. E. Yoder (*Alabama Sta. Bul. 245 (1936), pp. 52, figs. 9*).—This bulletin presents the results of 6 years' experimentation on the measurement and control of the sheet erosion process on Cecil clay. Its purpose is to present methods and procedure by which some of the basic principles involved in sheet erosion control may be analyzed and to apply these principles to Cecil clay. A set of 10 controlled plats, each 15 by 50 ft., was used, with two plats located on each of a 0, 5, 10, 15, and 20 percent slope. Experiments were conducted under wide variation of soil condition and vegetative cover.

The moisture content of the soil influenced the rate and extent of absorption and hence influenced run-off and soil movement during any given rain. A large portion of seasonal erosion losses invariably resulted from a few heavy rains which occurred when the soil was approximately saturated.

Rainfall intensity was more important than the quantity of rainfall in determining the amount of erosion when other conditions were held constant and when the rate of rainfall exceeded the rate of infiltration to an extent that appreciable run-off occurred. With a given intensity of rainfall, the greater the duration the greater the soil losses. Losses from intermittent rains of a given quantity were decidedly less than those from rains of continued duration, provided the rate of rainfall exceeded the rate of absorption. This was due to the inability of the soil to absorb the quantity of water during a given time. The exception to this was on smooth fallow, in which case the soil losses per unit of run-off decreased because the loose or slaked soil was readily carried off by the first part of the rain.

Pulverization and tillage practices which increased the rate and amount of absorption were very effective in controlling sheet erosion, provided the rate and amount of rainfall did not exceed the rate and amount of absorption. When the rate of rainfall greatly exceeded the rate of infiltration, excessive soil losses usually resulted from such tillage practices.

Aggregate analysis of sediments eroded from Cecil clay under a wide variety of conditions showed that the unit particles involved in the sheet erosion process, in the case of structural soils, were aggregates rather than textural separates. In general, soil material is moved layer by layer in the sheet erosion process. The relative loss of colloidal material may be excessive under a condition or combination of conditions which results in small quantities of run-off or in run-off of low velocity, or both.

Winter cover crops and other vegetative control measures functioned in reducing sheet erosion losses and soil movements by (1) filtering out the large soil particles and water stable aggregates, (2) decreasing the quantity of run-off, (3) decreasing the velocity of run-off, (4) minimizing the turbulence of run-off and hence lessening the abrasive or dispersive action of sediment-loaded water, and (5) by decreasing the mechanical dispersive action of beating rainfall.

Annual soil losses from land continuously in cotton were reduced to about one-half by the use of vetch as a winter cover crop. Rye, used as a winter cover crop, was nearly as effective as vetch in reducing erosion losses. Various width strips of soil-conserving crops were effective in reducing erosion and in decreasing the distance of soil movement on between-terrace slopes. It seems that if strip cropping is practiced, it should be used as a supplement to terraces rather than as a substitute for terraces.

Contoured, row-crop plantings had a pronounced soil- and water-saving ability when compared to slope plantings. The amount of soil eroded from slope-planted cotton was about twice as much as that from contour-planted cotton.

Erosion losses increased with increased slope under all conditions studied. The so-called "critical slope" or point above which a given soil cannot be cropped without excessive erosion losses is more dependent upon such factors as plant coverage and tillage practices than on topography itself.

Conditions influencing erosion on the Boise River watershed, F. G. Renner (*U. S. Dept. Agr., Tech. Bul. 528 (1936), pp. 32, figs. 14*).—This bulletin presents an analysis of the data collected during an intensive survey of erosion and related factors on the most seriously affected parts of the drainage within

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the Boise National Forest for use as a guide in planning protection and management of this and other watershed areas where similar conditions prevail.

With other factors equal, the amount and severity of the erosion was found to vary directly with gradient. Actually, however, the erosion increased as the gradient increased only up to approximately 35 percent; beyond this point, because other factors are not equal on steeper areas, the erosion decreases. On the steeper slopes, these factors, chiefly lighter grazing by livestock, are sufficiently powerful to reverse completely the trend toward increased erosion with increased gradient.

The causes of erosion were found to be most operative on southerly aspects. On northerly exposures, differences in temperature and moisture conditions gradually have brought about a vegetation cover which is more effective in its ability to hold the soil and prevent erosion. This vegetation in turn, and to a greater extent than on southerly aspects, has improved soil conditions through additions to the litter and organic matter. Moreover, the maintenance of these improved conditions on northerly aspects has been favored by lighter rodent infestations and less use by livestock.

Serious losses of the topsoil have occurred over extensive areas. With their normally coarse texture and comparative lack of binding properties, even the soils where this top layer can still be found erode easily. The loss of litter and organic matter through the removal of the top layer has still further reduced the soil's resistance to erosion and therefore has aggravated the effect of the factors of steepness, scant vegetation, rodent infestation, and overgrazing.

Erosion conditions differ sharply on the various range types. The weed and grass types in particular have suffered severely, and even in the sagebrush, browse, and timber types much damage has been done. The more seriously eroded types are those whose soil conditions have been the most disturbed by rodents and grazing.

A vegetation cover of less than 30 percent appears to have little appreciable effect in retarding erosion. This scant cover is found on more than one-half of the watershed. As the density of the vegetation increases above 30 percent the erosion rapidly decreases, and apparently a cover of 40 percent is sufficient to prevent gully erosion under normal conditions of grazing use.

Rodents have partially depleted the vegetation and disturbed the soil over four-fifths of the area studied. In addition, their effect upon erosion has probably been increased by their habits of concentration on southerly exposures and other areas which are heavily grazed by livestock.

The erosion was found to vary directly with the degree to which the vegetation cover has been depleted and the surface conditions disturbed by the grazing of livestock. Almost without exception, the areas which have been grazed most heavily are examples of the most severe erosion. On an area with the steep slopes, loose, coarse soil, and scant vegetation characteristic of this watershed, the degree of use by livestock appears to be of far more importance in its effect upon erosion than any other of the factors studied.

The use of bluegrass sod in the control of soil erosion, R. E. Uhland (*U. S. Dept. Agr., Farmers' Bul. 1760 (1936), pp. II+13, figs. 9*).—This supersedes Leaflet 82 (E. S. R., 66, p. 672), and is designed to further familiarize farmers with the various ways in which bluegrass may be used as a means of gully control.

New developments in terracing in the Southeast, M. L. Nichols (*Agr. Engin., 17 (1936), No. 9, pp. 393, 394*).—In a brief contribution from the U. S. D. A. Soil Conservation Service a summary of observations is given to indicate trends in engineering practice in soil erosion control in the Southeast. It is pointed

out that the general trend of this development is toward a coordinated program in which terracing is an important part.

A method of measuring acres per mile of terrace and total acres benefited, V. R. HILLMAN (*Agr. Engin.*, *17* (*1936*), *No. 9*, *pp. 395*, *408*).—This paper from the U. S. D. A. Soil Conservation Service describes a method of determining both the acres per mile of terrace and the actual area benefited by any number and length of terraces in a field or in a system of parallel terraces.

Determining the percentage of moisture in soil samples without drying, E. E. BAUER (*A. S. T. M.* [*Amer. Soc. Testing Materials*] *Bul. 81* (*1936*), *pp. 10, 11, 13, figs. 2*).—This paper is a report of efforts made at the University of Illinois to adapt procedure for the determination of the constituents of freshly made concrete to the determination of the moisture content of soils. It explains briefly the theory involved, describes the equipment and test procedure, and gives the results of tests and check tests of oven-dried samples.

Representing the distribution of ground stresses, K. FISCHER (*A. S. T. M.* [*Amer. Soc. Testing Materials*] *Bul. 81* (*1936*), *pp. 12, 13, figs. 6*).—This is a brief description of a method recently developed in Austria that enables representation of the distribution of stress in homogeneous masses of sand in a simple manner. The results have application to all soil dynamics work.

Control of high soil temperature, G. E. P. SMITH (*Agr. Engin.*, *17* (*1936*), *No. 9*, *pp. 383–385*, *figs. 7*).—This is a contribution from the Arizona Experiment Station relating to the development of methods for the control of high soil temperatures in the hot semiarid regions.

It was found that the cooling of the soil is due primarily to the evaporation of water on or near the soil surface. Apparently the initial temperature of the irrigation water is a minor factor. For comparison with the method of frequent irrigations, preliminary trials of other methods of soil cooling were conducted. A gray tar paper appeared to have no effect, and a loose earth mulch had very little effect. A mulch of alfalfa straw lowered the temperature 5° until the next irrigation, after which the advantage was only about 2°. Data obtained from four plats of 89 nursery trees each showed that soil under roofing paper was the hottest and soil under dry straw mulch was the coolest. The minimum daily temperature at 1 ft. depth occurred at noon.

Oiled-gravel roads of Colorado, E. B. HOUSE (*Colorado Sta. Bul. 426* (*1936*), *pp. 29*, *pl. 1*, *figs. 8*).—From several years' experimentation it has been found that conditions necessary for first-class oiled roads are (1) a well-compacted, dry subgrade, (2) adequate drainage, and (3) even distribution of oil throughout the matrix. To accomplish the last, the use of mixing machines in which the oil is under constant control is considered essential. Water in the aggregate up to 6 percent improves the matrix and provides a stronger and better wearing road surface if the materials are well mixed. A fine material in the aggregate is considered to be of special importance and should amount to not less than 10 percent.

Formulas from various sources for mixes are presented and discussed.

Public Roads, [November 1936] (*U. S. Dept. Agr.*, *Public Roads*, *17* (*1936*), *No. 9*, *pp. 203–221*+[*1*], *figs. 10*).—This number of this periodical contains data on the status of various highway projects as of October 31, 1936, and an article entitled The New York Financial Survey, by E. C. Paddock (pp. 203–218).

Gasoline and alcohol-gasoline blends, L. T. BROWN and L. M. CHRISTENSEN (*Indus. and Engin. Chem.*, *28* (*1936*), *No. 6*, *pp. 650–652*, *figs. 7*; *also in Proceedings of the Second Dearborn Conference of Agriculture, Industry, and Science, Dearborn, Mich., 1936. Dearborn: Farm Chemurgic Council, 1936, pp. 398–403, figs. 7*).—Tests are reported which were conducted at the Iowa Experiment Station with gasoline and a blend containing 10 percent of ethanol and 90 percent

of the same gasoline. The tests were conducted with a six-cylinder truck or bus engine of 4-in. bore and 5-in. stroke, developing its maximum power at about 2,800 r. p. m. The compression ratio was 4.85:1. The gasoline used was a 65–66 octane rating regular grade gasoline.

Less cooling water was required with the blend than with the gasoline as the fuel to maintain an outlet temperature of 150° F. There was no significant difference in the temperatures in other parts of the engine in shifting from one fuel to the other. The air-fuel ratio with a given speed, throttle opening, and carburetor jet was practically identical with the two fuels. The ratio with the blend was slightly lower with the 0.056-in. jet and slightly higher with the 0.068-in. jet. In effect, the substitution of the blend resulted in a mixture ratio slightly weaker than that obtained with gasoline under the same conditions.

The air-fuel ratios varied from 11–1 to 16–1. Within this range the power output is ordinarily increased by a decrease in the air-fuel ratio. Except at the higher speeds and with the highest air-fuel ratios, the blend gave a greater power output than did the gasoline. This result was obtained in spite of the fact that the mixture ratio was, in effect, smaller with the gasoline.

The blend gave appreciably less carbon monoxide under a given set of conditions than did the gasoline, but there was no definite ratio. In general, the decrease in carbon monoxide production could be accounted for on the basis of the difference in oxygen requirements of the two fuels. That is, if the two fuels were used with mixture ratios containing the same ratio of oxygen required to oxygen present, the carbon monoxide content of the exhaust gas would be the same for the two fuels.

The relative power output with the gasoline and the blend was affected by air-fuel ratio and engine speed, whereas the throttle position apparently had little or no influence upon the relative values. With the highest air-fuel ratios (15 or 16:1) and the higher engine speeds (1,600 to 2,000 r. p. m.) the blend was inferior to gasoline, but with the lower air-fuel ratios, and particularly at low engine speeds, the blend gave the greater power output.

In general, the blend was favored by low air-fuel ratio, low engine speed, and small throttle opening. There was no single relation between the relative specific fuel consumptions with the two fuels.

The data indicate that the carburetor setting with the gasoline and the 10-percent blend should be the same for satisfactory practical operation. Operations at low speed and at part throttle were particularly favorable as regards comparative advantage of the blend over gasoline, under which conditions the 10-percent alcohol blend gave slightly greater power output, appreciably lower specific fuel consumption, and a 30 to 50 percent lower carbon monoxide production than was obtained with the gasoline alone.

Calibration of cotton planting mechanisms, H. P. Smith and M. H. Byrom (*Texas Sta. Bul. 526 (1936), pp. 32, figs. 22*).—Tests were made on cell-drop and picker-wheel drop cotton planting mechanisms to determine the quantity of cottonseed planted per acre and the percentage of seed hulled in passing through the different types of planting mechanisms.

The smallest number of cottonseed dropped per acre by the cell-drop planting mechanisms tested was 39,778 at low-plate speed, while the largest number was 254,724 seed at high-plate speed. This is equivalent to 8.61 and 55.16 lb., or approximately 0.25 and 1.75 bu., per acre.

Picker-wheel drop planting mechanisms had a wider spread than the cell-drop planting mechanisms between the minimum and maximum quantities of seed dropped, ranging from 33,996 to 549,064 seed per acre. The equivalent in pounds is 7.36 and 118.87, or approximately 0.25 and 3.5 bu. per acre.

The size of the seed materially influenced the quantity of seed dropped. When the same plates and speeds were used to drop medium-sized Truitt cottonseed, from 47,569 to 87,043 more seed were planted per acre than with the larger-sized Ducona seed. Seed dropped by picker-wheel drop mechanisms ranged from 43,085 to 151,068 more medium-sized Truitt seed than large Ducona seed per acre.

The percentage of seed hulled by cell-drop planting mechanisms ranged from 0.001 to 1.47 percent. The highest percentage of seed hulled by picker-wheel drop planting mechanisms was 0.46 percent.

If 70 percent of the smallest and largest number of seed dropped by cell-drop planting mechanisms germinated, the number of plants obtained would range from approximately 2 to 12 per foot. To obtain a perfect stand of 14,520 plants per acre, from 1 to 11 plants per foot would have to be thinned out. The number of plants per foot for picker-wheel drop mechanisms ranged from 2 to 27, requiring the removal of from 1 to 26 plants per foot to leave 1 plant per foot.

Rubber as a protective device on concave teeth for threshing seed beans, B. L. Wade and W. J. Zaumeyer (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 725–726*).—Investigations conducted at Greeley, Colo., by the U. S. D. A. Bureau of Plant Industry for only two seasons and two varietal types of beans indicate that in some cases rubber on the concave teeth may give some slight protection, but probably not enough to justify the expenditure of time necessary to equip the thresher. It is deemed more important to control the cylinder speed of the machine, as well as the distance through which the beans fall after leaving the cylinders and the hardness of the surface upon which they drop.

The precooling of fresh fruit, T. E. Hienton and K. I. Fawcett (*Agr. Engin., 17 (1936), No. 9, pp. 377, 378, 382, figs. 5*).—In studies conducted by the Indiana Experiment Station cars of strawberries, peaches, and cantaloups from which the field heat had been partially removed and similar check cars without precooling were followed to market destination. Observations of precooled and nonprecooled cars of cantaloups shipped a distance of 500 miles revealed that the precooled ones on the top of the load ripened more slowly than did those not precooled. The fastest rate of cooling cantaloups was obtained by using two 18-in. disk fans to distribute the cold air. It was found that the container in which the produce is shipped may directly affect the rate of precooling. It appears that if peaches are to be precooled in a reasonable length of time the baskets, pads, and paper liners must be constructed to allow a greater passage of air than is now possible.

Chopping and storing alfalfa hay, T. E. Hienton and J. H. Hilton (*Indiana Sta. Circ. 221 (1936), pp. 4, figs. 2*).—Practical information is presented.

The storage of corn fodder or stover, E. A. Silver (*Agr. Engin., 17 (1936), No. 9, pp. 392, 394, fig. 1*).—In a brief contribution from the Ohio Experiment Station practical information is presented on the chopping of corn fodder and stover for mow storage. In studies made of the behavior of the chopped material in storage peak temperatures occurred approximately on the third and fourth days after the material was placed in the mow. These results in general were similar to those obtained with chopped hay. Following this peak the temperature began to drop slowly, with intermittent rises occurring at various times. At the end of 2 mo. a slight coat of mold had formed on top and around the exposed sides of the pile. Below the layer of mold there was no evidence of spoilage.

Rules for the aeration of silos [trans. title], M. R. Legendre (*Génie Rural & Élect. Rurale, 29 (1936), Sept., p. 30, fig. 1*).—In this contribution the term silo

is used to indicate a grain storage. On that basis graphic data are presented indicating the proper ventilation of grain storages for different conditions of humidity and conditions of grain in France.

Adobe construction, H. C. SCHWALEN (*Agr. Engin., 17 (1936), No. 9, pp. 387–389, figs. 2*).—In a contribution from the Arizona Experiment Station data on adobe construction in Arizona are presented, with particular reference to the influence of semiarid conditions.

Oil burners for home heating, A. H. SENNER (*U. S. Dept. Agr. Circ. 406 (1936), pp. 27, figs. 13*).—This circular is a revision of and supersedes Circular 405 (E. S. R., 56, p. 598), and relates only to power-operated types of oil burners. Practical information of a techincal character is presented.

Solar energy and its use for heating water in California, F. A. BROOKS (*California Sta. Bul. 602 (1936), pp. 64, figs. 39*).—This bulletin presents a technical analysis of the subject and reports the results of investigations on water temperatures and the rate of heating water in different solar heating systems.

It was found that enclosed 30-gal. hot-water boilers with glass covers can be used as solar heaters without pipe-absorber coils and will furnish two or three hot showers per tank in the late afternoon or evening of bright sunshiny days. These tank absorbers do not keep their high temperatures over night and are not a satisfactory means of obtaining hot water for washing clothes.

The glass area of the ordinary pipe-coil absorber should be about as large in square feet as the number of gallons of storage-tank capacity. The 0.75-in. pipes are conveniently spaced about 2.75 or 3 in. center to center and usually should be arranged in parallel circuits to avoid excessive temperature rise. The length of single pipe of about 70 to 100 ft. when the absorber discharges into the storage tank about 7 ft. above the center of the absorber gives over 30° F. temperature rise, which is adequate. When the tank inlet is lower the single-pipe length should be reduced in proportion.

The insulated storage tank used with regular pipe-coil absorbers should have a capacity equal to the whole day's hot water demand, because about half of the hot water is often used after sunset and about half is often needed early in the morning before the sunshine has time to heat much water.

To insure a constant supply of hot water regardless of the weather, the hot outlet pipe from the solar-heater storage tank can be connected to the cold inlet of an automatic auxiliary heater. Then if the solar-heated water is not up to thermostat-control temperature the automatic heater will operate to raise the temperature to the desired point. When there is good sunshine the water entering the automatic heater whenever a faucet is opened will already be hot enough, and the auxiliary heater need not operate.

Industrial wastes in New Jersey, W. RUDOLFS and L. R. SETTER (*New Jersey Stas. Bul. 610 (1936), pp. 22*).—The results of an industrial waste survey covering the more highly industrialized areas of New Jersey are briefly summarized. The number of industries visited amounted to 1,792, and definite waste information was obtained from 1,213 industries. Since many industries were duplicated, samples of 401 were obtained, 251 of which were completely analyzed and 150 partly analyzed for confirmation. The water consumption from which the samples were collected amounted to 54,800,000 gal. a day, and the liquid wastes discharged amounted to 43,651,000 gal. a day.

The quantity of wet suspended solids (5 percent) produced by the industries amounts to 700,000 tons a year as compared to 900,000 tons of sewage solids. The settleable solids, effective in sludge bank formation, amount to nearly 100,000 tons as compared with about 450,000 tons of sewage sludge. On the basis of oxygen consumption the estimated population equivalents for the in-

dustries in the State amount to over 3,000,000, or as much as two-thirds of the total domestic waste produced by the entire population of the State. The waste of the different industries varies considerably in solids production and oxygen demand. The oxygen requirements of the waste produced per employee by the different industries were from 2.9 to 470 times greater than the oxygen demand requirements of the sewage of one person, and the suspended solids produced for each employee was from 2.4 to 181 times greater than the suspended solids produced per person as domestic sewage.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (*Jour. Farm Econ., 18 (1936), No. 4, pp. 645–770, figs. 7*).—Papers are included as follows: The Italian "Battle of Wheat", by C. T. Schmidt (pp. 645–656). The Need for "Generalists", by A. G. Black (pp. 657–661); Rural Cooperative Credit Unions, by E. C. Johnson (pp. 662–672); Our Farm Credit System, by H. H. Preston (pp. 673–684); How Hogs Are Transported to Market in the Corn Belt, by K. Bjorka (pp. 685–694); Interrelationships of Livestock Production and Cropping Systems on Iowa Farms, by W. W. Wilcox (pp. 695–705); Monthly Poultry Costs and Returns, by K. T. Wright (pp. 706–710); Some Problems of County Government, by M. P. Catherwood (pp. 711–723); Farm Land Values as Affected by Road Type and Distance, by C. L. Stewart (pp. 724–735); and Technical Conditions Are Important Factors in Short-Time Movements of Wheat Prices, by H. S. Irwin (pp. 736–742).

Notes as follows are also included: Combination of Factors of Different Efficiency, by W. C. Waite (pp. 743–745); The National Income, and What Do We Know About It? by O. C. Stine (pp. 745–747); The Need for Area Index Numbers, by J. D. and G. Black (pp. 748–750); Farm Management Research and Changing Price Relationships, by J. C. Bottum (pp. 750–755); Do Present Trends in the Teaching of Economics Jeopardize the Future Value of Research? by D. N. Donaldson (pp. 755–758); Some Effects of Maintaining Retail Prices of Whole Milk at Artificial Levels, by J. T. Palmer (pp. 759–761); The Relation of AAA Reductions to Gold Prices and Purchasing Power of Cotton, by P. A. Eke (pp. 761–765); The Cost of Terracing Farm Land Cooperatively, by G. H. Ward (pp. 765–768); and The Grain Monopoly in Czechoslovakia, by S. Bordaevski (pp. 768–770).

Report of the Chief of the Bureau of Agricultural Economics, 1936, A. G. Black (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1936, pp. 22*).—Data are reported on the agricultural balance, recent trends in farm income, and the farm real estate situation.

[Investigations of agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 183 (1936), pp. 140–142*).—The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 76, p. 259) is brought down through August 1936. An article by H. R. Moore on The Farm Foreclosure Situation includes tables showing the number of foreclosures, acreage, amount of judgments, and valuation and sales consideration for lands by semiannual periods July 1933 to June 1936, and the number, total, and per thousand farms of farm foreclosures and voluntary assignments to financial institutions in lieu of foreclosure in Greene, Putman, and Union Counties by years 1925 to 1936 and from January to June 1935 and 1936.

Current Farm Economics, Oklahoma, [December 1936] (*Oklahoma Sta., Cur. Farm Econ., 9 (1936), No. 6, pp. 127–160, figs. 2*).—Included in addition to the usual tables of index numbers are articles on Outlook for Demand and Prices of Farm Products in 1937, by T. R. Hedges (pp. 128–131); Oklahoma

Farmers' Recommended Adjustments in Their Farm Organizations to Conserve Soil Fertility and Control Erosion, by H. A. Miles (pp. 131–133); Some Trends in the Farm Mortgage Credit Problem, by O. D. Duncan (pp. 137–142); and A Study of Man Labor Requirements on Garfield County Farms, by P. Nelson and E. A. Tucker (pp. 142–147).

[Investigations in agricultural economics by the Texas Station, 1934–35] (*Texas Sta. Rpt. 1935, pp. 10, 11, 107–116*).—Results of investigations not previously noted are reported on the organization and management of farms in the high plains cotton area of the State, by C. A. Bonnen, in cooperation with the Bureau of Agricultural Economics, U. S. D. A.; on quality as a factor in the marketing of vegetables in the lower Rio Grande Valley, by W. E. Paulson; and on costs and services of local government in the State, by L. P. Gabbard and H. C. Bradshaw.

Land systems and land policies in Nebraska, A. E. Sheldon (*Nebr. State Hist. Soc. Pub., 22 (1936), pp. XVI+383, [pls. 3, figs. 68]*).—This is a history of Nebraska land—public domain and private property—from the aboriginal period to 1936. "Nebraska land history exemplifies and illustrates, in conspicuous degree, the results of past and present land systems in the United States of America." The more important data are included under the following chapter headings: Indian land tenure and its extinction; the preemption and land warrants period, 1854–63; homestead, railroad land grant, and agricultural scrip period, 1863–72; the land "boom" period, 1873–91; new land policies, 1891–1902; reclamation and Kinkaid homestead period, 1902–32; westward extension of farming; the conflict between the cattlemen and the grangers; national politics and Nebraska land frauds; Indian reservation lands; State lands; mortgages and lands; results of land policies in Nebraska; new land policies, Nebraska and national; and a final survey.

An economic study of land utilization in Chenango County, New York, H. S. Tyler (*[New York] Cornell Sta. Bul. 654 (1936), pp. 63, figs. 18, map 1*).—This bulletin is the sixth in the series previously noted (E. S. R., 75, p. 861).

The area and its agriculture are described. The lands of the county are classified according to intensity of present and probable future use, and the land use, soils, real estate values, etc., are noted and comparisons made of farm businesses on the different classes of land. The development of roads, rural mail delivery service, rural electrification, and reforestation are also discussed.

Land in class I comprises about 28 percent and that in class II about 17 percent of the area of the county, and in general is better adapted to forestry and recreational uses than to agriculture. About 54 percent is in land classes III, IV, and V, and probably will remain permanently in agriculture. Approximately 75 percent of the area of land class I and more than 40 percent of that of land class II is idle or in woods. In the higher land classes, a relatively large percentage is in intertilled crops and legume hays. About 10 percent of the soils in the county are valley and intermediate soils, and mostly well adapted to the production of intensive crops. The large area of upland soils supports a less intensive type of farming.

An analysis of 619 labor-income records showed that the average farm business in the higher land classes was larger and more efficient. Full value per acre of land and buildings ranged from $8 in land class I to $57 in land class V. Towns with a high average land class tended also to have high values per acre for land and buildings in each land class.

In 1933, about 401 miles of road or approximately one-fourth of the road mileage in the county, had been hard-surfaced. An additional 115 miles had been sub-based. It is suggested that about 325 more miles be improved as

hard roads. "If these were constructed, most of the farms and rural residences in land classes III, IV, and V would be on hard roads. About 500 miles of road will be needed only for forest and recreational travel if land classes I and II are reforested. Rural mail carriers travel almost 50 percent of the mileage of usable roads and serve about 60 percent of all occupied farms and 75 percent of all occupied rural residences in the county. In land classes I and II, 43 percent of the farms had rural delivery, as compared with 67 percent in land classes III to V. . . . .

"Approximately 30 percent of the farms and 40 percent of the rural residences in land classes III, IV, and V were connected to electric distribution lines in 1933. It took about 280 miles of line to supply this service. About 505 miles of extensions have been suggested to make service available to all farms and rural residences in land classes III, IV, and V."

On January 1, 1936, about 48,500 acres in the county had been purchased or were under contract by the State for reforestation purposes.

English farming, past and present, LORD ERNLE (*London and New York: Longmans, Green & Co.,* [*1936*], *5. ed., pp. XVI+559, fig. 1*).—This is a new edition of the work previously noted (E. S. R., 57, p. 885), edited by A. D. Hall. The history of tithes has been brought down to the present time. The chapters on adversity, 1874–1912, uncertainty, and peacetime farming, 1919–27, have been rewritten or replaced by chapters on the great depression and recovery, 1874–1912, agricultural legislation since the war, small holdings, education and research, and technical progress since the war. The data included in the appendixes on agricultural population, imports of food, and agricultural statistics have been brought down through 1931, 1935, and 1935, respectively, and a table has been added showing the annual index numbers, 1919–35, of wholesale prices of all articles and prices of agricultural produce, feeding stuffs, and fertilizers.

A statistical study of commercial egg production in Delaware, R. O. BAUSMAN (*Delaware Sta. Bul. 202* (*1936*), *pp. 79, figs. 30*).—This study was made to determine the uneconomical practices and systems of poultry management, with a view to assisting poultrymen in supplanting such practices. Records covering the year ended September 30 were obtained from poultry farms in the 3 largest commercial egg-producing areas in the State, there being 115 records in 1931 and 1933, and 114 in 1932. Records of approximately 100 poultry farms for a period of 3 yr. were also made available by the extension service of the University of Delaware. Data as to prices of eggs, trends of egg production, etc., were obtained from the publishers of The Producers' Price-Current, the Bureau of Agricultural Economics, U. S. D. A., and the Federal Bureau of the Census.

The development and economic position of the poultry industry in the State is described, and analysis is made of the effects on egg production and the costs of production of various factors. Some of the findings were as follows:

Delaware farmers receive from approximately 6 to 10 ct. per dozen more for eggs than do Iowa farmers. An increase of 100 layers per flock reduced the cost of egg production 1 ct. per dozen. An increase of 10 eggs per layer reduces the cost 2.2 ct. per dozen. As high a quality of pullets were produced using 20 lb. of feed per pullet made up of 43.8 percent mash as with 34 lb. of feed made up of 62.8 percent mash and the cost was 30 ct. less per pullet. February-hatched pullets as compared with May-hatched pullets had differentials for the laying periods of 41.4 eggs, 5.5 ct. per dozen in the prices of eggs, and $1.88 in the value of eggs. The cost of producing eggs was no greater. Pullet flocks produced 51.1 more eggs than did hen flocks. The average price paid for eggs from pullet flocks was 5.5 ct. per dozen higher, the

total value of eggs for the laying period $1.86 greater, and the cost of producing eggs 4.5 ct. per dozen less. A ratio of hens to pullets of approximately 25 : 75 is more nearly in keeping with good management than the old accepted ratio of 50 : 50. Where artificial lights were used the rate of egg production increased during the periods the lights were used but decreased when lights were discontinued, so that the annual rate of production was no greater than where lights were not used. The average price per dozen of eggs was the same in both groups. The cost of production was 1.6 ct. per dozen higher with lights. Chicks from commercial hatcheries were equal in quality and the mortality rate as low as that from chicks batched from home selected eggs. Range, frequency of changing litter, feeding of wet mash, type of floor in laying house, and construction of the fronts of laying houses appeared to have no influence on the rate of egg production. Feeding green feeds to flocks confined in houses during the winter months, feeding of cod-liver oil, and greater floor space per layer increased egg production moderately. Flocks with a high mortality rate averaged 26.1 eggs less per layer and a depreciation of 17 ct. more per layer, a cost of 5 ct. more per dozen eggs, and a labor income of $210 less per farm than flocks with a low mortality rate. Source and quality of chicks, date of hatch, rate of feeding, floor space per chick and per layer, range, frequency of changing litter, screening of droppings, and feeding of cod-liver oil and green feeds appeared to have only slight influence on the mortality rate and no influence on the prevalence of poultry paralysis. Heavy culling increased the production per layer, but the cost of production per dozen eggs was approximately 1 ct. greater than where light culling was practiced.

"Laying flocks averaging at least 900 birds, pullets hatched in February or not later than March, a ratio of hens to pullets of approximately 25 : 75, the limited use of artificial lights, the rearing of pullets on limited feeding of a low mash ration when on range, and a conservative culling policy appears to be the most advantageous economic program for Delaware commercial poultrymen."

An economic study of 99 poultry farms in Maryland, W. E. Hauver, S. H. De Vault, and A. B. Hamilton (*Maryland Sta. Bul. 397 (1936), pp. 35, figs. 4*).—The records used in this study relate to the calendar years 1931 to 1933 and were obtained by personal interviews with farmers in six counties selected on the basis of the importance of the industry in the county. Analysis is made of the effects on profits of type of poultry enterprise, size of business, eggs produced per hen, capital turnover, use of feed, use of labor, selling price of eggs, and cost of producing eggs.

For the 99 farms the average annual farm income was $1,171 and the average labor income $728. Eighty-four farms had plus farm incomes and 67 plus labor incomes. The average receipts were $3,524, of which 76 percent was from sale of poultry, 17 percent from crop sales, 6 percent from other livestock, and 1 percent from other sources. The average farm and labor incomes on the 20 most profitable farms were $3,474 and $2,900, respectively, as compared with —$165 and —$648, respectively, for the 20 least productive farms.

Recommendations are made as to size of business, rate of egg production, diversity of enterprises, and efficiency in the use of labor and capital and in marketing.

Succulent feed crops: Cost of producing in northern Wisconsin, E. J. Delwiche (*Wisconsin Sta. Bul. 436 (1936), pp. 16, figs. 10*).—Trials with corn silage, rutabagas, and sunflower silage were carried on from 1919 to 1935 at the Ashland Substation, and with corn silage and rutabagas from 1919 to 1928 at the Conrath demonstration farm in Rusk County. The average labor costs per ton and per ton of digestible nutrients were for the Ashland Sub-

station (1919–27) sunflowers $3.25 and $19.65, rutabagas $4.22 and $42.30, and corn silage $4.69 and $27.23; at the Conrath farm (1919–28) corn silage $3.26 and $19.44 and rutabagas $2 and $17.65. Data are also included as to yields and feeding value.

Economic effects of the corn-hog program in Iowa, R. H. Roberts (*Iowa Jour. Hist. and Politics, 34 (1936), No. 2, pp. 144–171*).—The condition of the corn and hog industry in Iowa as it has developed under the corn-hog programs of 1934 and 1935 is compared with what it would have probably been without such programs.

The processing tax on wheat, M. S. Kendrick (*Amer. Econ. Rev., 26 (1936), No. 4, pp. 621–636*).—The problems of administration of the processing tax on wheat under the Agricultural Adjustment Act, the yield of the tax, the incidence of the tax, and the effect of the tax on recovery are discussed.

Crop and livestock insurance: A selected list of references to literature issued since 1898, compiled by E. M. Colvin and M. T. Olcott (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 67 (1936), pp. VIII+264*).—This mimeographed bibliography includes 972 annotated references to publications in the United States and foreign countries. "The bibliography is classified under broad subject headings, with references arranged alphabetically under country in each section. There is of necessity a large general section followed by sections dealing with crop, forest fire, frost, hail, and livestock insurance. Under these broad subject headings may be found references to material relating to the history of these different types of insurance; experiments which have been made in the past; plans presented within recent months; legislation, both proposed and actual; and comment and opinion as to the feasibility of such insurance." References relating to the insurance of agricultural labor are omitted, and those dealing with fire insurance relate only to growing crops or to standing timber. References are made to material published in foreign languages only when English summaries could be readily obtained.

Part-time farming by negroes near Lexington, Kentucky, M. Oyler, W. W. Rose, and W. D. Nicholls (*Kentucky Sta. Bul. 365 (1936), pp. 107–121*).—This study, similar to the one previously noted for white families (E. S. R., 74, p. 867), was made in cooperation with the Federal and Kentucky Emergency Relief Administrations. Data covering the year ended March 31, 1934, were collected from 104 negroes near Lexington.

The tracts averaged 2.9 acres in size, one-third being ¼ of an acre or less and one-fifth containing ½ acre. Twenty-six of the tracts were operated by tenants. The work on the tracts averaged 1.8 mo. during the year. The agricultural investment of 60 of the 78 owners was less than $1,000. The average investment in livestock and machinery was $22 for tenants and $87 for owners. The average total income of the operators was $399, of which 48 percent was from work off the tracts, 14 percent from farm receipts, 18 percent from food furnished from the tracts, and 17 percent was the value of the use of the dwelling. The average earnings per operator were $81 from the tracts and $204 from outside income. Three-fifths of the families were young people with few children or retired families whose children had left home.

"The experience of these farmers indicates that many persons who undertake part-time farming with the hope of financial gain are likely to be disappointed. The chance to reduce the cost of living appears to be the chief advantage to be gained by living on a part-time farm. Cheaper food and housing make the part-time farm most attractive to large families with small incomes because such families spend a large share of their income for food and rent; besides, the children can help with the farm work and get recreation in the open country rather than in city streets."

Regulating the marketing of farm products by State authority, T. Macklin, W. J. Kuhrt, and E. L. Vehlow (*Calif. Dept. Agr. Bul., 25 (1936), No. 3, pp. 295–340*).—The developments under the provisions of the following 1935 California statutes are presented briefly: Stabilization and Marketing of Fluid Milk and Fluid Cream, California Agricultural Adjustment Act, and California Marketing Agreement Act. The appendix includes the stabilization and marketing plan for fluid milk for the San Francisco marketing area, the marketing agreement regulating the handling of walnuts grown in California, and the marketing agreement for canning asparagus grown and canned within the State.

Agricultural research projects in marketing which are in progress in the Northeastern States (*New Hampshire Sta., 1936, pp. [8]+28*).—This report on projects arranged by the marketing committee of the New England Research Council on Marketing and Food Supply shows as far as possible for each project in progress the title, leaders, date of beginning, probable date of completion, and the principal objectives and comments on the significant findings to date (October 1936).

Report of the Chief of the Grain Futures Administration, 1936, J. W. T. Duvel (*U. S. Dept. Agr., Grain Futures Admin. Rpt., 1936, pp. 8*).—The act of Congress of June 15, 1936, changing the name of the Grain Futures Act to the Commodity Exchange Act, amending the act in many important respects and extending the provisions to embrace cotton, butter, eggs, potatoes, mill feeds, and rice, and the establishment of the Commodity Exchange Administration are described. Tables show for the year ended June 30, 1936, (1) the volume of trading, extent of commitments, the total actual grain delivered, and related data. The litigation during the year is reviewed.

Ohio farmer owned elevators: Their financial operations of 1935–36, B. A. Wallace (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 95 (1936), pp. 18*).—This eighth number in the series previously noted (E. S. R., 74, p. 716) is based on the main balance sheets and income and expense items of 189 plants, the detailed analysis of expense items of 45 companies, and commodity sales and margins of 41 companies.

Cooperative marketing of range livestock, L. B. Mann (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 7 (1936), pp. IV+134, figs. 43*).—"This bulletin deals principally with the growth and development of cooperative livestock-marketing associations in the western range States." The economic factors affecting production and marketing of range livestock, the characteristics of the western range livestock-producing sections, and the development of cooperative marketing in the range territory and conditions tending to further cooperation are described. The organization set-up, operation methods, and the growth and development of six representative cooperative terminal marketing and three typical direct marketing associations in the range territory are described in more detail. The methods of operation, weaknesses, organization, membership, and operating problems of the two types of associations and cooperative financing of livestock in the range territory are discussed. Analysis is made of the field methods and methods and problems of obtaining and filling orders for feeder stock, the receipts, methods of transportation of cooperatives operating in the western and midwestern markets and of the income and expenses of 13 western and Corn Belt markets. The opportunities for further progress in cooperative marketing in the range territory are discussed. Appendixes include the lamb feeding agreement of the Intermountain Livestock Marketing Association, the marketing agreement of the Producers Livestock Marketing Association of Salt Lake City, and a list showing the name, address, and year of organization of the large scale cooperative livestock-marketing associations in 1935.

The pooling of lemons, with special reference to the Santa Paula Citrus Fruit Association.—A progress report, H. R. WELLMAN and M. D. STREET (*California Sta. Mimeogr. Rpt. 55 (1936), pp. 67*).—This is a progress report of an analysis of the pooling operations of the Santa Paula Citrus Fruit Association. It is divided into three parts—grade pools, size pools, and time pools. What occurs under each type of pool and the advantages and disadvantages of each type are analyzed and discussed.

Cooperative purchasing of farm supplies, J. G. KNAPP and J. H. LISTER (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 1 (1935), pp. IV+92, figs. 15*).—The aims and principles of cooperative purchasing of farm supplies, the legal basis, structure, and financing of farmers' cooperative purchasing associations, the methods used in cooperative purchasing, and factors essential to efficient operation of cooperative associations are discussed and suggestions made for guidance in organizing cooperative purchasing associations. The development and present status of cooperative purchasing by farmers in the United States and European and other countries are described. Lists are included of the literature cited, of other selected books and bulletins on cooperative purchasing, and of sources of current information on cooperative purchasing in the United States. Appendixes include (1) a table showing the name, address, and value of farm supplies purchased and farm products marketed by purchasing and marketing associations in each of the 12 Federal Credit Administration districts in the United States; and (2) an article (pp. 88–92) by J. M. Wright on Exemption of Farmers' Cooperative Associations From Certain Federal Taxes.

A survey of mutualistic communities in America, R. ALBERTSON (*Iowa Jour. Hist. and Politics, 34 (1936), No. 4, pp. 375–444*).—Brief descriptions of a number of communities are included and certain general conclusions drawn.

Crops and Markets, [November 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), No. 11, pp. 377–404, figs. 3*).—Included are tables, charts, reports, summaries, etc., of the usual types covering crop and livestock estimates, market reports of livestock, livestock, dairy, and poultry products, grains, feeds, seeds, cotton and cold storage holdings, and the price situation of agricultural products.

The first world agricultural census: Union of South Africa, Commonwealth of Australia, Finland, Argentina, Peru (*Internatl. Inst. Agr. [Rome], First World Agr. Census Buls. 5 (1936), pp. 48; 6 (1936), pp. 67; 9 (1936), pp. 35; 11 (1936), pp. 34; 16 (1936), pp. 11*).—These bulletins continue the series previously noted (E. S. R., 74, p. 872). No. 5 presents data for the Union of South Africa, No. 6 for the Commonwealth of Australia, No. 9 for Finland, No. 11 for Argentina (census of livestock), and No. 16 for Peru.

RURAL SOCIOLOGY

Factors in the success of rural organizations, F. BOYD, M. OYLER, and W. D. NICHOLLS (*Kentucky Sta. Bul. 364 (1936), pp. 83–105*).—This study, centered around 16 rural organizations selected from the 70 found in 4 representative rural communities in Kentucky, "indicates that training and developing the members and leaders of rural organizations offers the surest method of developing the human resources of rural Kentucky and improving Kentucky agriculture as a way of life."

The trend of rural relief in ten Ohio counties, June 1 to December 1, 1935, C. L. FOLSE and C. E. LIVELY (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 96 (1936), pp. 22, pls. 6*).—The object of this report is to show the trend of relief and to describe the changes which occurred in the rural relief population in Ohio from June 1 to December 1, 1935, when the Federal Emergency Relief Administration stopped giving relief.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Organization and costs of Montana schools: An analysis of the system of financing elementary and secondary education with suggested changes, R. R. Renne (*Montana Sta. Bul. 325 (1936), pp. 104, figs. 30*).—This is an analysis of the present system of financing elementary and secondary education in Montana with suggestions for changes. A summary of the more important findings has been noted (E. S. R., 74, p. 874).

The public school system of the State, school administration, school facilities, enrollment, number, training, and experience of teachers, the sources and size of school receipts, ability of school districts to support schools, size and purpose of school expenditures, the factors determining relative costs in different districts, and the weaknesses of the present system are discussed. A reorganization program is outlined.

"Among the many deficiencies in the present financial and administrative organization of Montana schools are: (1) There are a great number of administrative units (2,116 school districts) and consequently many independent, elective and administrative offices (6,512 school board trustees); (2) the taxing districts vary much in size and wealth and many are too small to provide adequate school support; (3) many schools are operated with extremely low pupil-teacher ratios resulting in high costs per pupil; (4) the financial and accounting procedure is frequently unwieldy and inefficient because of the extreme decentralization of administration; and (5) the financial support of the schools is not stabilized or on a sound and permanent basis because of too large reliance upon local taxes. If these weaknesses are removed in whole or in part, farm taxes would be reduced, the quality of educational services improved, and the administrative efficiency of the schools increased. A reorganization program to correct the above weaknesses must reduce appreciably the present excessive number of administrative units and supplement local district and county taxes with substantial support from State and Federal sources."

FOODS—HUMAN NUTRITION

Some factors affecting the cooking quality of the pea and Great Northern types of dry beans, E. B. Snyder (*Nebraska Sta. Res. Bul. 85 (1936), pp. 31, fig. 1*).—Dry beans of the Great Northern and pea types secured from farms in the western part of the State, including some on sand-hill soil, from two commercial sources in the State, and from experiment stations in Michigan, Colorado, Idaho, and Montana, were studied for factors, either inherent or environmental, which might affect their cooking quality and for modifying procedures.

Each quantity of beans, after being cooked by a uniform method, was sorted by hand into two portions, one of the beans sufficiently soft, and the other of those too hard, for edible use as determined by puncturing each bean by hand with a No. 5 sewing needle. The beans were also judged for edible quality by a special committee.

The important factors determining the cooking quality of the beans studied were found to be the properties of the seed coat and the germinal area of the bean. The initial natural entrance of water into the bean is through the micropyle and germinal regions. The passage of water through the general surface of the seed coat is limited by the structure and composition of the seed coat, which may be hard (1) inherently or (2) as the result of environmental conditions during harvesting and storage or (3) through the effect of chemical solutions such as hard water.

The problem of inherent hardness is suggested to be one for plant breeders to solve by careful selection over a period of years of seeds with permeable

seed coats. The second type of variation in permeability is governed largely by temperature and moisture conditions. Storage in tightly closed containers held at a temperature in the neighborhood of 45° F. was found to be optimum. The third type of variation in permeability is also related to the first, for the nature of the chemicals producing hardness or softness of the seed coat depends upon the composition of the seed coats. Analyses of these showed that they contained relatively large amounts of pectic materials, in the form of pectic acid or pectates, and calcium and small amounts of protein, magnesium, and fatty materials. Beans of the Great Northern type contain about twice as much calcium as the pea beans.

The water absorption of the beans was decreased, and the seed coats were hardened by solutions of hydrochloric and acetic acids in certain concentration and by solutions of sulfates and chlorides of calcium and magnesium. Sulfates and chlorides of sodium and potassium had no deleterious effect, and sodium bicarbonate and ammonium salts of oxalic, citric, and tartaric acids softened the seed coats. It is considered that the use of limited amounts of sodium bicarbonate in practical bean cookery may be justified because of its effect upon the pectic constituents of the seed coats.

Practical bean cooking studies involving customary methods of soaking, parboiling, and cooking in the oven, with or without the addition of various flavoring agents were carried out. Very satisfactory results from the standpoint of flavor and tenderness were obtained when the beans were baked for 4 hr. at a temperature of 350° without preliminary soaking and parboiling. Higher oven temperatures, 400°–450°, produced a satisfactory product in a shorter time, but it was necessary to use a larger amount of water and the beans were crusty. The material of the baking dish, tightness of cover, and temperature of the oven are all factors affecting the amount of water required. The method selected should be determined by the cost of fuel and attention required during the baking.

Factors affecting the cooking qualities of potatoes, M. D. Sweetman (*Maine Sta. Bul. 383 (1936), pp. 297–387, pl. 1, fig. 1*).—This bulletin, the purpose of which is "to consider factors causing the variations in potatoes which are of interest to the consumer because they affect value in use, and consequently to the farmer because they affect demand for his product", reviews critically the work of other investigators in the field, and presents the results of the author's studies during a period of 7 yr. In these studies, some of which have been noted from other sources (E. S. R., 66, p. 486; 68, p. 273; 71, p. 559), the author has had the cooperation of D. Folsom and J. Chucka in supervising the securing of the potatoes and of M. W. Dow and M. G. Moore for laboratory assistance.

An introductory section on the appraisal of potatoes from the consumer standpoint closes with the statement that the intelligent selection of potatoes requires primarily a more complete understanding of the factors affecting cooking quality and paring waste. To this end about one-third of the bulletin is devoted to a discussion of the structure of the potato and its composition as affected by various factors and the remaining two-thirds to the properties of potatoes most closely related to their value for culinary use.

The work of the station points to a certain correlation between the percentage of starch or dry matter and mealiness, but with many exceptions to the general rule. The negative correlation between nitrogen content and mealiness is considered to be too irregular to have much significance. In the absence of satisfactory chemical or physical standards for cooking quality, the station recommends buying potatoes by sample and testing the sample under the cooking conditions to be employed in the household as "the most certain method by which the consumer can insure his satisfaction. Storage at temperatures as

high as 60° F. is essential to retain or improve quality found at time of purchase. Inspection at the market may enable one to avoid lots which will give excessive paring waste, but neither appearance nor variety can insure uniform cooking qualities." Other useful hints to the housewife are given as follows:

"Cooking technics influence mealiness, relative high temperatures, and practices which facilitate escape of steam after cooking is complete being favorable. Probably baking and boiling are superior to steaming for highest mealiness. . . . Sloughing can be minimized by cooking bud and stem halves of tubers separately, especially in the fall when bud ends cook more quickly than stem ends. . . . Browning, especially noticeable when frying is the method of cooking, is due to caramelization of sugar and can be controlled indirectly through storage temperatures." Other types of color change on cooking are noted. One of these is caused by the action of iron salts or certain types of hard water on pigment-producing material in the potato. The blackening which may develop on cooking, and especially on standing after cooking, is attributed to an amino acid or other compound which oxidizes to form pigments of the melanin type.

An extensive list of literature references is appended.

Cake and cake making ingredients, L. H. BAILEY and J. A. LECLERC (*Cereal Chem., 12 (1935), No. 3, pp. 175–212*).—In this contribution from the U. S. D. A. Bureau of Chemistry and Soils, the extensive literature on the subject is reviewed and the results of numerous experimental cake-making studies at the Bureau are summarized.

A survey of milk consumption in 59 cities in the United States (*U. S. Dept. Agr., Agr. Adjust. Admin., Consum. Counsel Ser., Pub. 2 (1936), pp. IV+33, figs. 3*).—A survey was made of the purchases of whole and evaporated milk by 28,966 representative families in 59 cities during a single week of April or May 1934. Questionnaires were also distributed to 250 selected children in schools located in slum, industrial, and middle-class or well-to-do sections of each city.

The average consumption of whole and evaporated milk amounted to 2.44 qt. per person per week. The highest per capita consumption of whole and evaporated milks per week was reported in the Pacific Division (2.75 qt.), followed in order by the West North Central (2.71), Mountain (2.67), New England (2.66), East North Central (2.38), West South Central (2.33), Middle Atlantic (2.27), East South Central (2.04), and South Atlantic (1.93 qt.).

A definite relationship between milk consumption and income was observed for practically all the cities, the families consuming relatively low amounts of milk being those with small incomes and low expenditures for food, large number of persons, and children. "The consistent repetition of the relationship suggests that the apparent correlation between size of family and per capita milk consumption is not to be accounted for by race, nationality, or climate."

Foaming of egg white, M. I. BAILEY (*Indus. and Engin. Chem., 27 (1935), No. 8, pp. 973–976, figs. 5*).—The author describes a new method for determining the foaming power of egg white and testing the stability of the foam obtained. No pronounced difference was found in the foaming power of frozen and unfrozen whites other than the tendency of the thawed white to reach a maximum volume in a shorter whipping time and to show greater leakage. If stability of foam is desired, the egg white should not be whipped to its maximum degree of foaming. A greater volume of foam was obtained with thick than with thin whites. With increasing time of whipping, the leakage for the thick whites increased and that of thin whites decreased.

When the pH was varied from 9.5 to 5 by treatment with phosphoric acid the untreated egg white showed a higher foaming power than the treated white, while the foam of the treated egg white adjusted to a pH of 7 or 6 was more stable than the foam of the untreated egg white. If a stable foam is desired, the best results are obtained by prolonged whipping of the egg white adjusted to approximately pH 5. Adding egg yolk decreases the foaming power of the egg white, but to a less extent than when olive oil is added in an amount equivalent to the fat content of the yolk.

[Food studies at the Colorado Station] (*Colorado Sta. Rpt. 1936, pp. 29, 30*).—In continuation of the investigation on baking flour mixtures at high altitudes, progress is reported on a study of the effects of various factors on the characteristics and tensile strength of yellow sponge cake, which is next in simplicity to the previously studied angel food cake (E. S. R., 75, p. 278). Progress is also reported on the study of the culinary quality of potatoes (E. S. R., 75, p. 278).

[Foods and nutrition research of the Texas Station] (*Texas Sta. Rpt. 1935, pp. 124–128, 165, 166*).—Progress reports (E. S. R., 75, p. 131) are given by J. Whitacre on an extension of the analysis of the records of growth in weight and height of Texas school children (E. S. R., 74, p. 877) to show some aspects of the physical status of the three race groups studied, and on a study of the effect of tea upon the energy metabolism of children; by Whitacre, L. R. Hawthorn, and S. H. Yarnell on factors affecting the storage of cucumbers; by S. Cover and H. Schmidt on the effect of oven temperature on the tenderness of meat and on the processing of canned meat; and by H. M. Reed on a continuation of fig products investigations.

Food and Drugs Act, W. G. CAMPBELL (*U. S. Dept. Agr., Food and Drug Admin. Rpt., 1936, pp. 1–19*).—This annual report on the enforcement of the Federal Food and Drugs Act (E. S. R., 74, p. 721) contains summaries of the food adulterations investigated involving public health, filth and decomposition, and economic cheats; of the seizures of canned fruits and vegetables under the McNary-Mapes amendment; of the inspection of the shrimp-canning industry under the sea-food amendment; and of the inspection and seizure of chemicals and medicinal preparations reported as complying with the standards of the United States Pharmacopoeia and National Formulary or sold under their own standards of strength, and of proprietary medicines, anesthetic ether, and rubbing alcohol. Progress reports are also given of the work of the Vitamin Division and the Division of Pharmacology, of the development of new analytical methods and apparatus, and comments on court cases.

The newer ideas in health inspection, F. W. FABIAN (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 10, pp. 295, 313*).—This general discussion closes with the recommendation that every employee in the food and dairy industry be required to take a complete medical examination by a competent physician, with laboratory examination of blood, feces, and urine at the time he is employed and semiannually thereafter, and that in addition as an added protection all employees coming in direct contact with food, milk, or dairy products be examined daily by a nurse, foreman, or some other person for evidence of contagious diseases. It is also suggested that "only people who are inherently clean should be employed in the food or dairy industry. All new employees should be watched carefully until they have been so classified."

Height, weight, and age tables for homogeneous groups, with particular reference to Navaho Indians and Dutch whites, M. STEGGERDA and P. DENSEN (*Child Devlpmt., 7 (1936), No. 2, pp. 115–120, figs. 2*).—Because of the desirability of height and weight tables specifically for homogeneous groups, tables

have been prepared for 3,332 Navaho Indian children from 6 to 18 yr. of age and 3,730 Dutch white children from 6 to 15 yr. of age.

A nutrition study of a Slavic agricultural family according to a record of the food consumption for one year [trans. title], H. Pelc and M. Podzimková-Riegolová (*Trav. Inst. Hyg. Pub. Tchécoslov., 5 (1934), No. 4, pp. 129–162, figs. 12*).—Using the individual method, food consumption details were recorded for a family consisting of the grandmother, mother, father, and two small children.

Curves show a minimum food consumption during the winter, a definite ascent to spring, and the largest consumption in the summer. The selection of foods was made almost entirely from those foods produced on the farm, so that milk was the principal food and very little meat was eaten. The menus appear monotonous, but the authors conclude that if this is a typical example, the farm families in this district of central Czechoslovakia are receiving adequate diets.

Plotting of a graphic record of growth for children aged from one to nineteen years, L. M. Bayer and H. Gray (*Amer. Jour. Diseases Children, 50 (1935), No. 6, pp. 1408–1417, figs. 6*).—In the method described the charts are planned on the expectancy that the stature of 96 percent of normal boys and girls will fall within 8 percent above or below the average height for the age, and the weight within ±20 percent for boys and ±24 percent for girls. The graphs provide a simple visual record of a child's growth, shown by a progressive process related to the individual developmental tendency of the child, as well as to the normal value.

Maintenance nutrition in the pigeon.—The influence of dietary protein and vitamin B_4, C. W. Carter and J. R. O'Brien (*Biochem. Jour., 29 (1935), No. 12, pp. 2746–2754, fig. 1*).—In this contribution to the question as to the nature of the multiple deficiencies in an exclusive diet of polished rice responsible for the syndrome of human beriberi and avian polyneuritis, a series of feeding experiments with pigeons is reported, leading to the following conclusions:

Limitation of protein rather than total caloric intake is one of the factors which prevent full weight recovery in pigeons on polished rice supplemented solely by a vitamin B_1 preparation, but the evidence thus far does not differentiate between limitation of protein per se and a deficiency of some specific amino acid. The response to an adequately adjusted protein intake is only partial or may be absent entirely if the preliminary period of depletion on polished rice results in a fall of weight below 70 per cent of the maximum. "In such cases recovery is limited by the appearance of a deficiency of vitamin B_4, which is wholly or largely lacking in the diet. This deficiency can be corrected by the administration of vitamin B_4 in the form of extracts of liver. Our experiments, therefore, seem to indicate that two factors at least are necessary to promote weight restoration in pigeons on polished rice supplemented with vitamin B_1: (1) Protein in adequate amount and (2) vitamin B_4."

The influence of nutrition on the production of ulcers in the pro-stomach *of the rat,* P. Arons and M. P. J. van der Rijst (*Arch. Néerland. Physiol. Homme et Anim., 21 (1936), No. 2, pp. 274–282, fig. 1*).—Observations are reported on the extent of stomach ulcer formation in groups of rats fed various deficient diets. Although the proportion developing ulcers on a vitamin A-free diet was higher than on the other deficient diets, ulcers were also found in some rats on a diet deficient in vitamins B_1 and the B complex, on diets qualitatively complete but fed in limited amounts, and in starvation.

Blood plasma protein regeneration controlled by diet.—*Effects of plant proteins compared with animal proteins. The influence of fasting and* infection, J. B. McNaught, V. C. Scott, F. M. Woods, and G. H. Whipple (*Jour. Expt. Med., 63 (1936), No. 2, pp. 277–301*).—The general plan of the

studies reported was similar to that employed by Whipple and associates in long-continued investigation of factors promoting hemoglobin regeneration in dogs rendered anemic by repeated bleedings. In the present investigation the plasma proteins of dogs were depleted by the removal of whole blood and the return of normal red cells suspended in Locke's solution. This process was repeated daily until the plasma protein levels were reduced from normal (5–7 percent) to about 4 percent. The substances to be tested were then added to the basal diet and the plasmapheresis continued at definite intervals. From analyses of the blood samples the potency ratios of the supplemental feedings were determined, *these being the number of grams of protein which had to be fed to regenerate 1 g of plasma protein in a depleted standard dog.*

The plant proteins tested were quite well utilized to form new plasma protein, with soybean meal rated at the head of the list. "It is utilized with unexpected promptness and favors the production of albumin in contrast to other plant proteins which distinctly favor globulin production." In two experiments with soybean meal the potency ratios were 4.6+ and 7.1. Other values reported were bran 4.3, rice polishings 5.3, potatoes 6.1, liver 6.4, spleen 10.2, brain 11.8, and stomach 13.6.

Long plasmapheresis periods on basal rations rich in grain proteins were found to lower the resistance of the animals to infection. In fasting only *from 4 to 6 g of plasma protein per week were formed.*

Fat and calcium metabolism.—III, The influence of butter and margarine upon the fecal output of Ca in full-grown rats, A. Westerlund (*Lantbr. Högsk. Ann. [Uppsala], 2 (1935), pp. 51–70, fig. 1; Swed. abs., pp. 67–69*).—In continuation of previous studies (E. S. R., 73, p. 127), the object of this investigation was to compare the effect of butter and margarine on the calcium metabolism of albino rats. Eight male rats were subjected to at least one margarine and one butter experiment. The food mixtures were uniform in energy value, 11 containing margarine and 9 butter, the quality and quantity of the fat being the only variable factors.

The calcium eliminated in the intestine was much greater in the margarine group, but no significant difference could be found regarding urinary calcium elimination. The author concludes that with a moderate calcium consumption the body loses much more calcium when the fat in the diet is margarine than when it is butter. No definite reason for this is given, but it is suggested that the vitamin D content of the butter may be a factor or that the greater concentration of fatty acids in the margarine may affect the calcium metabolism.

Experimental sodium chloride deficiency in man, R. A. McCance (*Roy. Soc. [London], Proc., Ser. B., 119 (1936), No. 814, pp. 245–268, fig. 1*).—This is the report of a study of severe uncomplicated salt deficiency in one woman and two men, all in good health when the experiment began. The diet consisted of salt-free "casein" bread, synthetic salt-free milk, salt-free butter, fruit, thrice boiled vegetables, jam, home-made salt-free shortbread, and toffee. Water was taken as desired. A forced loss of sodium and chlorine was produced by the very low salt intake and by sweating under controlled conditions.

The low salt content of the body—about 25–30 percent of the body's extracellular ions were removed—caused evident signs of debility, loss of the ability to taste, cramps, weakness, lassitude, and, upon any degree of exertion, cardiorespiratory distress. The tests showed a negative nitrogen balance, an increase in the blood urea, a reduction of blood volume, and a rise in hemoglobin, protein, and colloid phosphorus in the serum. There was a reduction of the concentration of sodium and chlorine in the serum, with a fall in its total osmotic pressure.

The determination of vitamin A by means of its influence on the vaginal contents of the rat, K. H. Coward, M. R. Cambden, and E. M. Lee (*Biochem.*

Jour., *29* (*1935*), *No. 12*, *pp. 2736–2741*, *figs. 3*).—The method described is based upon the vaginal smear method of detecting vitamin A deficiency as first reported by Evans and Bishop (E. S. R., 50, p. 163) and later confirmed by Baumann and Steenbock (E. S. R., 69, p. 630) and others.

Female rats which had grown to about 130 g in weight on a diet of moderate vitamin A content were examined by the vaginal smear method until it was determined that the cycles were occurring regularly and were then placed on a vitamin A-free diet until keratinized cells appeared in the vagina for 10 successive days. One dose only of the vitamin A-containing substance to be tested was then given, and the length of time before the disappearance of cornified cells was determined by daily smear tests.

When single doses of 5, 10, 20, 40, 60, 100, and 200 mg of cod-liver oil were given to groups of rats thus prepared and the mean number of days elapsing between the administration of the dose and the disappearance of cornified cells was plotted against the respective dosage, the curve was logarithmic in shape. When the duration of the cure in days was plotted against the respective single dosage of cod-liver oil, the curve which resulted was not logarithmic.

The probable error in this method of estimation in the results obtained with 10 rats was +36.2 or −26.4 percent, which was slightly greater than that obtained in a 3 weeks' growth test on young female rats which had been given daily doses of vitamin A after they had ceased to grow on a diet deficient in that factor.

The effect of vitamin A deficiency on the development of the retina and on the first appearance of visual purple, K. Tansley (*Biochem. Jour.*, *30* (*1936*), *No. 5*, *pp. 839–844*).—Attempts were made to obtain rats deficient in vitamin A during the first 3 weeks of life in order to determine whether such a deficiency would result in abnormalities in the rod structure of the developing retina as well as in the formation of visual purple.

Only a moderate deficiency of vitamin A in rats during the suckling period could be induced, for too severe a deficiency during pregnancy led to a prolonged gestation period, abnormal and difficult labor, and failure to suckle the young. In young rats suffering from a mild deficiency of vitamin A the development of visual purple was retarded and in some cases prevented, but the effect on the structure and development of the rods was not so marked. This is thought to indicate that the first effect of vitamin A deficiency on the developing retina is on the visual purple formation, with damage to the rod structure as a later effect.

Further study of the growth effect of the residue remaining after alcoholic extraction of yeast, M. R. Rymer and R. C. Lewis (*Jour. Biol. Chem.*, *114* (*1936*), *No. 2*, *pp. 361–367*).—In a further study of the alleged third factor reported by Williams and Lewis (E. S. R., 65, p. 94) to be present in the yeast after prolonged alcoholic extraction, a similar experimental procedure was followed to that reported earlier, using five different preparations as the vitamin supplements. These were unfractionated yeast extract and the yeast residue described by Williams and Lewis, a rice polishings concentrate relatively rich in vitamin B and poor in vitamin G made according to the method of Evans and Lepkovsky (E. S. R., 65, p. 613), and two preparations rich in vitamin G and poor in vitamin B. One of these was dried autoclaved liver prepared according to the method of Graham and Griffith (E. S. R., 69, p. 899) and the other egg white concentrate prepared according to the method of Chick, Copping, and Roscoe (E. S. R., 65, p. 591).

The addition of each of these preparations except the yeast residue to the diet on which the deficiency had been demonstrated resulted in increased growth which was not stimulated further by the addition of the yeast residue.

Although admitting that the previously demonstrated growth-promoting ability of the yeast residue must be due in large measure to the presence of vitamins B and G, the authors state that they "do not feel justified in drawing the unqualified conclusion that the yeast residue contains no other growth factors than those of vitamin B and vitamin G. We are working with very complex, impure substances, and it must be borne in mind that the liver, rice polishings concentrate, or yeast extract may have contained the same 'third factor' that was postulated for the yeast residue. The final solution of the problem of whether a third factor actually exists lies in the use of preparations of vitamins B and G which are free from traces of other factors."

Effects of vitamin B on the blood count and hemoglobin content of normal albino rats, R. SUMNER (*Colo. Univ. Studies, 23 (1936), No. 4, pp. 315–320 fig. 1*).—This is an investigation of the effect of whole vitamin B and crystalline vitamin B_1 on the blood counts of rats receiving a normal diet. Thirty-four albino rats from 57 to 68 days old were divided according to sex into two control and two experimental groups. The control diet consisted of 10 ml of a mixture consisting of 1 packed level tablespoonful of powdered milk with 60 ml of water, a half leaf of lettuce, and 1 heaping teaspoonful of boiled wheat. Five drops of cod-liver oil were administered every other day. The experimental groups were fed whole vitamin B in the form of 12 mg of powdered yeast in milk every day as a supplement to the control diet. The genetic factor was controlled.

One male rat about 9 mo. old and of unknown genetic background was also given crystalline vitamin B_1 in the amount of 1 mg daily for 5 days, alternating with 5-day periods without the vitamin.

The rats receiving whole vitamin B showed an increased erythrocyte count and a decrease in the hemoglobin percentage, leucocyte, and blood platelet counts from those of the control rats. During the days the crystalline vitamin B_1 was fed, the one rat noted above showed a significant decrease in the erythrocyte count, a slight rise in percentage of hemoglobin, and increased leucocyte and blood platelet counts. A comparison of the results shown by the one rat of unknown genetic background with those of the groups of rats of known strain indicated that the effects on the blood constituents produced by the whole vitamin B are not due to the B_1 factor.

Further evidence for the existence of vitamin B_4, O. L. KLINE, C. A. ELVEHJEM, and E. B. HART (*Biochem. Jour., 30 (1936), No. 5, pp. 780–784, figs. 2*).—In this contribution from the Wisconsin Experiment Station further experimental evidence confirming the earlier observations of Reader (E. S. R., 64, p. 195) is presented for the existence of vitamin B_4 and its necessity in the normal nutrition of the rat. It is shown that success in producing vitamin B_4 deficiency in the rat depends to a very large extent upon the purification of the various constituents of the diet.

In the experiments reported the diet (44_{3A}) was designed after that used in the chick experiments noted on page 515, but more highly purified. The dextrin was heated for 24 hr. at 120° C., and the casein, prepared from skim milk, was purified by reprecipitation from dilute ammonium hydroxide solution with dilute hydrochloric acid at pH 4.6 and washing with distilled water, the treatment being repeated three times. The vitamin supplements other than B_4 included two crystalline vitamin B_1 preparations, a commercial water-extracted liver residue autoclaved 10 hr. at 120° to destroy any residual B_4 and a vitamin B_2 concentrate prepared according to the method of Elvehjem and Koehn (E. S. R., 74, p. 885).

The technic for producing the deficiency was that of Reader (E. S. R., 65, p. 594). In a subsequent experiment the vitamin B_1 concentrate was replaced by crude liver extract powder which had been aerated in water solution at 100° for 24 hr. to destroy vitamin B_4. The Reader technic of first producing polyneuritis in the rats was found unnecessary, and from the tenth day suckling rats were given the diet (44_{2B}) supplemented with 0.5γ of vitamin B_1 per gram of diet. From the twenty-fifth day the rats received 5γ of vitamin B_1 daily by dropper.

The rats showing symptoms of vitamin B_4 deficiency were inactive, sat in an extremely hunched position, and when walking retained the characteristic humped back, "walking high" on the hind legs, and as the condition developed, noticeably lost coordination. The diets were supplemented when the growth rate declined and when symptoms of vitamin B_4 deficiency appeared. Rats on the basal diet 44_{2B} gained 25 g in weight in a 5-week period. When the diet was supplemented with vitamin B_4 concentrate (E. S. R., 68, p. 726) the gain was 139 g, and when 10 percent of peanuts was included in the diet the gain was 105 g. These supplements also completely cured the paralytic symptoms.

Vitamin B_1 deficiency in the rat's brain, J. R. O'Brien and R. A. Peters (*Jour. Physiol., 85 (1935), No. 4, pp. 454–463*).—In continuation of studies on tissue respiration and metabolism during vitamin B_1 deficiency (E. S. R., 75, p. 285), data were obtained on the respiration in vitro of teased brain tissue of normal and neuritic rats. In avitaminous brains in vitro the oxygen uptake was increased by the addition of vitamin B_1, and abnormal amounts of pyruvate were reduced. The effects of the addition of vitamin B_1 were negligible with the normal brain. The observations on oxygen uptake indicated that the symptoms of vitamin B_1 deficiency in the rat and pigeon originated in the optic lobes and the lower parts of the brain. The symptoms had the same biochemical origin.

The biochemical lesion in vitamin B_1 deficiency: Application of modern biochemical analysis in its diagnosis, R. A. Peters (*Lancet [London], 1936, I, No. 21, pp. 1161–1164, 1165, figs. 2*).—The author presents a review of the in vitro experiments with vitamin B_1, demonstrating that vitamin B_1 appears to act as a catalyst in the oxidative removal of one of the lower degradation products of carbohydrate metabolism, pyruvic acid. This view is substantiated by experiments showing the presence of pyruvic acid in the brains of avitaminous birds and in the blood of beriberi patients. In improving the pigeon test for vitamin B_1, the author found that the addition of minute amounts of crystalline vitamin B_1 in vitro to the avitaminous brain tissue of the bird restored the diminished tissue respiration. The ability of vitamin B_1 to increase oxygen uptake can be used as a test for the estimation of the vitamin, and in vitro research upon brain tissue may be applied in vivo.

Most of the evidence reviewed has been noted above.

Observations on the heart rate in vitamin B_1 and C deficiency, G. Sankaran and B. G. Krishnan (*Indian Jour. Med. Res., 23 (1936), No. 3, pp. 747–754, figs. 2*).—The bradycardia test for vitamin B_1 deficiency, first noted by Drury et al. and later used by Birch and Harris (E. S. R., 73, p. 567) in estimating the vitamin B_1 content of foodstuffs with rats as the experimental animal, was studied with both pigeons and rats, with results confirming those of the above-noted investigators. Similar heart tests applied to guinea pigs on a vitamin C-free ration showed a marked increase in heart rate, or tachycardia, beginning at about the ninth week.

Factors affecting the vitamin C content of apples, E. L. Batchelder and E. L. Overholser (*Jour. Agr. Res. [U. S.], 53 (1936), No. 7, pp. 547–551*).—In

this contribution from the Washington Experiment Station. Delicious apples grown on unringed branches and Winesap apples grown on ringed branches were adjusted early in July to approximate leaf-fruit ratios of 60 and 20 leaves to each fruit. After harvesting the apples were stored at 32°. As in a previous study (E. S. R., 73, p. 136), a modification of the Sherman, LaMer, and Campbell method of determining vitamin C was followed.

It was concluded that the ratio of leaf area to fruit affected the vitamin C content of apples only indirectly, i. e., as it affected the size of the fruit produced; that the size of the fruit was an important consideration under common methods of sampling because the ratio of skin to pulp was higher in small apples than in large apples, and the skin contained a higher concentration of vitamin C than the pulp; that storage at 40° resulted in greater loss of vitamin C than did storage at 32°; and that the vitamin C content of Delicious apples in the present study corresponded closely with values hitherto reported from this laboratory.

The excretion of vitamin C in normal individuals following a comparable quantitative administration in the form of orange juice, cevitamic acid by mouth, and cevitamic acid intravenously, E. E. Hawley, D. J. Stephens, and G. Anderson (*Jour. Nutr., 11 (1936), No. 2, pp. 135–145, figs. 4*).—The variations of vitamin C excretions of 12 normal young adults were studied by the Harris and Ray technic (E. S. R., 73, p. 427) during periods of low and high vitamin C intake. For a period of 1 week the subjects were given a diet free from fresh vegetables, fruits, tomatoes, and tomato juice, reducing the vitamin C intake to 10–20 mg per 24 hr. For the second period of 8 days the diet was supplemented by 400 cc of orange juice estimated to have 50–60 mg of cevitamic acid per 100 cc. In the third period the orange juice was reduced to 200 cc, with the addition at the end of the period of 100 mg of cevitamic acid given first orally and then injected intravenously. Before concluding the study the subjects were put on a vitamin C-free diet for 2 days, followed by additions of 400–1,000 cc of orange juice. Four figures are given in which the daily intakes in 24-hr. excretions of cevitamic acid are plotted.

The amount of vitamin C normally excreted by individuals varied between 15 and 28 mg per 24 hr. It was increased to comparable levels by daily additions of orange juice and cevitamic acid given orally. The injected cevitamic acid was excreted more rapidly and completely than that given by mouth. Individuals varied in their response to increased doses of vitamin C. No change was noted in the cevitamic acid content of blood or capillary fragility during the low and high vitamin periods.

Effect of ingestion of acid and alkali upon amount of vitamin C found in urine, E. E. Hawley, J. Frazer, L. Button, and D. J. Stephens (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 218, 219*).—Unexplainable variations in the vitamin C output of several individuals in the study noted above suggested the possibility that changes in the pH of the urine might be responsible for the difference in results. In preliminary tests marked changes in the vitamin C content of the urine of a subject were found to be correlated inversely with the pH values. To test this further, 3 subjects at first and later 2 were on a constant diet with the pH varied by the ingestion of $NaHCO_3$ or NH_4Cl, with frequent determinations of the vitamin C of the urine after its administration as orange juice and as cevitamic acid by mouth and by intravenous injection.

A marked decrease in output resulted in all cases when the urinary pH was in the alkaline range of 7.5–8.1. The effect was found not to be due to a reversible oxidation. It is thought more likely that it was due to better utilization (increased storage) of the vitamin rather than its destruction.

The effect of incomplete diets on the concentration of ascorbic acid in the organs of the rat, S. S. Zilva (*Biochem. Jour., 30 (1936), No. 5, pp. 857–867*).—This paper reports a repetition of the studies by Hopkins and Slater (E. S. R., 76, p. 134) leading to the hypothesis that the liver is the ordinary site of vitamin C synthesis, but that in the absence of carbohydrate in the liver the intestine is capable of synthesizing the vitamin from some other precursor, probably protein.

Some of the major results reported by Hopkins and Slater could not be reproduced, while others were differently interpreted. The author, therefore, concludes that "Hopkins's hypothesis, attractive as it may be, is so far not fully supported by experimental evidence."

The relation between the composition of the diet and the urinary excretion of ascorbic acid, R. K. Chakraborty and A. N. Roy (*Indian Jour. Med. Res., 23 (1936), No. 3, pp. 831–836*).—The excretion of ascorbic acid in the urine on diets differing in the proportions of fat and protein was followed with two healthy Bengali males.

In one of the subjects the average daily urinary output of ascorbic acid on the usual Bengali high carbohydrate diet was 9.54 mg. This rose to 12.07 mg on a high protein (meat diet), fell to 10.21 mg on resumption of the high carbohydrate diet, rose again to 14.09 mg on a high fat (butter) diet, fell to 9.57 mg on resumption of the high carbohydrate diet, and rose to 14.65 mg on another high protein (casein) diet. Corresponding values for the second subject were high carbohydrate 9.75 mg, high protein (meat) 11.08, high carbohydrate 8.51, high fat 14.8, high carbohydrate 10.46, and high protein (casein) 13.12 mg.

It is suggested that the higher figures for urinary excretion of ascorbic acid in England, as reported by Harris and Ray (E. S. R., 73, p. 427), are due to a greater consumption of meat in that country. It is also noted that the relatively low figures reported in the present study do not necessarily indicate vitamin C subnutrition, as in some unpublished experiments a sharp peak in urinary excretion followed the ingestion of extra vitamin C.

Vitamin C in the urine in health and disease [trans. title], W. v. Drigalski (*Klin. Wchnschr., 14 (1935), No. 10, pp. 338, 339*).—This paper reports an investigation of the effect of age and disease upon the daily amounts of vitamin C excreted in the urine as determined by the method of Harris and Ray (E. S. R., 73, p. 427). The values obtained were about 50 percent higher and showed greater variation than those reported by Harris and Ray, indicating a lower amount of vitamin C in the diet of the English persons.

The average daily excretion of ascorbic acid of healthy adults amounted to 37–79 mg, or an average of 50 mg per 100 cc. The highest amounts noted were 100 and 114 mg. Age and sex, except for the nursing mother, had no marked effect upon the amounts excreted. Diets rich in vitamin C increased the vitamin excretion. Nursing infants excreted an average daily amount of 16 mg, which with the addition of fruit juices at 4 mo. increased to 22 mg. Children 5 mo. to 1 yr. excreted an average of 24 mg, and children aged 8–10 yr., 25–30 mg daily.

In 51 cases persons afflicted with a disease showed no variation from the normal in the amounts of vitamin C in the urine. In general the diseases were those which affect the functions of HCl, the stomach, liver, and kidneys; metabolism as in diabetes, exophthalmic goiter, and disturbances of endocrine glands; and those accompanied either by high fever or fever for long periods of time.

The vitamin C excretion was not altered by exposure to the sun or by diets rich in vitamins A, B, and D, or by the types of diets customarily fed to

diabetic, nephritic, and ulcer patients. Large amounts of liquids caused an increased elimination of the vitamin. However, the amounts excreted did not show a definite relation to the amount of urine, but showed a limitation in the amount similar to other constituents of the urine. The highest concentration was 10.4 percent. Increased ingestion of vitamin C in the presence of a disease resulted in increased excretion in the urine.

The nursing mother excreted about half the amount of vitamin C excreted by the man when both partook of the same foodstuffs. The nursing child excreted approximately the other half of the total amount.

Vitamin C in the urine in health and disease [trans. title], E. GABBE (*Klin. Wchnschr., 14 (1935), No. 17, p. 613*).—The author states that the above noted observations of Drigalski on the excretion of vitamin C in the urine are unwarranted, since other substances, particularly thioneine which is present in large quantities in the urine, similarly reduce the dye giving vitamin C values approximately 30 percent above absolute amounts.

Vitamin C in the urine in health and disease [trans. title], W. v. DRIGALSKI (*Klin. Wchnschr., 14 (1935), No. 17, p. 614*).—In reply to the criticism of Gabbe, as noted above, the author states that while the method used to determine vitamin C by the reducing action of ascorbic acid and certain other substances in the urine is not specifically accurate, it cannot be denied that the method is useful for obtaining comparative values.

Vitamin C studies in urine and blood [*trans. title*], E. GABBE (*Klin. Wchnschr., 15 (1936), No. 9, pp. 292–296, figs. 2*).—The purpose of this study was to determine the forms in which vitamin C is present in the blood and urine, the effect of oxidizing substances on the stability of the reduced form of ascorbic acid, and the effect of increased intake on the stability of the reduced form. The determinations on these fluids were made with the iodine reduction method and the methylene blue method described by Martini and Bonsignore (E. S. R., 73, p. 746) before and after treatment with hydrogen sulfide.

To determine the presence of an oxidizing substance in urine, blood plasma, and deproteinized blood, 100 mg percent ascorbic acid was added in vitro to the fluid. This was then neutralized with sodium hydroxide solution and allowed to stand for 5 min., after which it was treated with trichloroacetic acid, titrated with methylene blue and iodine solutions, and the loss in ascorbic acid through oxidation calculated. To determine the oxidized form of ascorbic acid the same procedure was followed but with distilled water in place of blood and calculating the difference in the values obtained by the two determinations.

The ascorbic acid was found to occur in the urine in the reduced, reversibly oxidized, and oxidized forms. The methylene blue values showed that a healthy person on a normal diet excreted daily from 16 to 35 mg of ascorbic acid, of which from 16 to 90 percent was present in the reduced form. The iodine values were regularly from 4 to 5 times higher than the values obtained with methylene blue solutions. Treatment with hydrogen sulfide to reduce the reversibly oxidized form of ascorbic acid increased the values obtained by both methods, but notably from 2 to 3 times more with the iodine reduction method. An addition of 250 mg of ascorbic acid to the diet of a healthy person increased the amount of ascorbic acid excreted in the urine from 40 to 48 mg determined with the methylene blue method and from 210 to 235 mg determined with the iodine method after treatment with hydrogen sulfide. The loss of ascorbic acid in the urine in vitro, from 10 to 12 mg of ascorbic acid determined with the methylene blue method and from 10 to 20 mg determined with the iodine method, indicated the presence of an oxidizing substance in the urine. While blood plasma in vitro caused no oxidation of added ascorbic

acid, blood corpuscles as shown with deproteinized blood always contained oxidizing substances. The daily addition of 300 mg of ascorbic acid to the diet of 3 patients increased the amount of ascorbic acid in the urine, but decreased the amount of the oxidized form in the blood and urine. This decrease was thought to be due to a reduced oxidizing power of the fluids. Parallel to the reduction of oxidized ascorbic acid was a reduction of glutathione in the blood of 2 patients but not in that of the third. When glutathione free from ascorbic acid was added to the hemolyzed blood an increased oxidation of ascorbic acid took place. A substance protecting ascorbic acid against oxidation in the body was indicated, but its nature was not revealed by this study.

The antirachitic effectiveness of vitamin D from various sources, R. W. Haman and H. Steenbock (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 505–514, fig. 1*).—This contribution from the Wisconsin Experiment Station reports several series of experiments undertaken with the general aim of determining "how many forms of vitamin D must be recognized, to what extent each occurs in nature or is produced artificially by irradiation, what factors influence the activity of each, and how each may be evaluated properly by laboratory assays with animals."

In the first series the relative effectiveness for rats and chicks of irradiated oils of plant and animal origin was determined. In the work with rats it was shown that irradiation of the fish oils tested failed to increase their vitamin D activity, while corresponding irradiation of plant oils increased this activity to a varying extent. It required from 15 mg of irradiated coconut oil to 750 mg of irradiated soybean oil and lard to give an antirachitic activity equivalent to 1 Steenbock (rat) unit or 3.3 international units of vitamin D.

The vitamin D activity of cod-liver oil for chicks was not increased by irradiation, and the effectiveness of the vitamin D in various fish oils was approximately the same for the chick as for the rat. Commercial tuna-liver oil and pure halibut-liver oil were somewhat less effective, unit for unit, than the other oils tested. The vitamin D in irradiated coconut oil, wheat germ oil, and peanut oil was much less potent for chicks than for rats.

In another series of experiments it was shown that propylene glycol as a solvent for vitamin D did not increase its effectiveness, that the solvent in which ergosterol or cholesterol was dissolved during irradiation had no effect on the relative antirachitic effectiveness for chicks of the resultant D vitamins, and that purified cholesterol heated and then irradiated produced a response in chicks more like that produced by irradiated crude cholesterol than irradiated ergosterol. Absorption bands could be detected in the spectrum of heated purified cholesterol.

Vitamin D in child health, F. O. Tonney (*Amer. Jour. Pub. Health, 26 (1936), No. 7, pp. 665–671, figs. 2*).—The purpose of this paper is to review the recent experimental data on vitamin D in child health from the standpoint of growth, bone development, tooth development, posture, and resistance to infection.

The evidence of rickets in cities is far higher than that for any of the common infections of childhood, such as measles, scarlet fever, whooping cough, and diphtheria. On the basis of recent surveys, rickets is conceded to be present in at least 50 percent of the child population under 2 yr. of age. Recent progress with antirachitic agents advocated for the cure or prevention of rickets cannot be demonstrated, but definite results are evidenced from the fact that the incidence of rickets is receding both in severity and number of cases. The potential usefulness of vitamin D milk as an antirachitic agent cannot as yet be judged. A table showing the sale of vitamin D milk as compared with the total sale of milk in Chicago from June 1934 to June 1935 is given.

A theory concerning the mechanism and the significance of the allergic response, W. T. VAUGHAN (*Jour. Lab. and Clin. Med.*, *21* (*1936*), *No. 6*, *pp. 629–649*).—The purpose of this paper is to demonstrate the basic identity of clinical allergy as seen in human beings and experimental anaphylaxis as seen in animals. A theory is presented that the allergic response is primarily a protective reaction manifested by environmental maladjustment. The two factors appear to be heredity and the nature of the exciting substance. There appear to be all grades of response to exciting factors. For the alleviation of symptoms the author suggests either avoidance of environment, or, if that is not possible, desensitization. The hypothesis suggests two lines of experimental approach—through the endocrine system, especially the adrenals, and the autonomic nervous system. It is possible that neither system is responsible for the mechanism.

The action of choline and other substances in the prevention and cure of fatty livers, C. H. BEST and H. J. CHANNON (*Biochem. Jour.*, *29* (*1935*), *No. 12*, *pp. 2651–2658*).—A detailed review is given of studies at the Liverpool (E. S. R., 76, p. 128) and the Toronto (E. S. R., 74, p. 280) laboratories on the action of choline and other substances in the prevention and cure of dietary fatty livers. The differences in the results reported from the two laboratories are shown to be "not at qualitative variance but to differ only in degree, governed by the somewhat different conditions under which experiments have been carried out."

The precautions necessary for planning diets adequate for observing the effects of choline are discussed, and new data obtained at the Liverpool laboratory on the preventive action of choline on the "fat" and "cholesterol" fatty livers, confirming findings previously obtained at the Toronto laboratory, are reported.

The influence of the caseinogen content of diets on the nature of the "cholesterol" fatty liver, A. W. BEESTON, H. J. CHANNON, and H. WILKINSON (*Biochem. Jour.*, *29* (*1935*), *No. 12*, *pp. 2659–2667*).—Further data are reported which confirm the results of Channon and Wilkinson (E. S. R., 76, p. 128), in showing that "in the cholesterol fatty liver the dietary protein fraction exercises a profound lipotropic effect. By the use of graded protein percentages in the diet it is thus possible to produce cholesterol fatty livers of widely varying composition, and these findings have been used in further experiments for studying the preventive effects of choline. These experiments have shown that the addition of approximately 80 mg of choline per rat per day very largely prevents the deposition of glyceride, but only partially prevents that of cholesteryl esters. No deductions could be made from the experiments as to whether choline is exerting its effect through lecithin synthesis or whether choline has a direct action in preventing cholesteryl ester deposition. The lipotropic effect of the protein fraction differs superficially at least from that of choline in that the absolute amount of liver phosphatide is increased."

Cystine and the dietary production of fatty livers, A. W. BEESTON and H. J. CHANNON (*Biochem. Jour.*, *30* (*1936*), *No. 2*, *pp. 280–284*).—In this continuation of the studies noted above, groups of rats were maintained on a low choline diet containing 40 percent beef drippings and 5 percent casein supplemented with amounts of cystine varying from 3.25 to 80 mg daily over periods of from 14 to 21 days. Expressed on the basis of the 100-g rat, the mean value for the weight of liver fat for the control animals was found to be 1.077 g as compared with 2.02 g for the animals which received cystine. It appeared that the addition of cystine approximately doubled the amount of fat deposited in the liver.

The effect of various facts in the production of dietary fatty livers, H. J. Channon and H. Wilkinson (*Biochem. Jour., 30 (1936), No. 6, pp. 1033–1039*).—Following the experimental procedure of the study noted above, the authors tested various fats in the low choline diet containing 40 percent of fat and 5 percent of casein. The total lipoids present in the livers corresponding to the various fats at the end of 14 days were butterfat 30.67, beef fat 27.05, palm oil 26.35, coconut oil 20.54, olive oil 15.57, and cod-liver oil 7.18 percent of the fresh liver weight. The total lipoids were fractionated into phosphatide and glyceride fractions, and the fatty acids from all the fractions were analyzed by the Twitchell procedure and the iodine value and molecular weight were determined. The results indicated that the nature of the fat in the livers was markedly influenced by that of the dietary fat.

Further observations on the effect of dietary caseinogen in the prevention of fatty livers, A. W. Beeston, H. J. Channon, J. V. Loach, and H. Wilkinson (*Biochem. Jour., 30 (1936), No. 6, pp. 1040–1046*).—In continuation of the studies noted above with rats receiving diets containing 40 percent of fat and 5 percent of casein, experiments were carried out to determine the preventive action of casein equivalent to that of choline, to study the effect of marmite on the degree of fat accumulation in the liver, and to determine the minimum amount of choline contained in the experimental diet which exercised an effect on liver fat deposition. Varying percentages of choline chloride were added to the diet, supplemented by marmite for some groups of rats. Two groups of rats received, with and without marmite, the experimental diet in which an additional 25 parts of casein had replaced an equivalent amount of glucose.

The results showed that 1 g of casein is equivalent in its preventive action on liver fat deposition to from 7 to 8 mg of choline. Marmite did not exert any effect other than that due to the choline content. In the experimental diet containing 5 percent of casein, 3 mg of choline a day exerted a marked preventive action and reduced the liver fat deposition from 20 to 10 percent.

Studies on endemic and experimental goitre, C. E. Hercus and H. D. Purves (*Jour. Hyg. [London], 36 (1936), No. 2, pp. 182–203*).—The reports of previous goiter studies (E. S. R., 69, p. 315) are continued in this report of a survey in certain New Zealand districts and in the islands of Samoa showing the urinary excretion of iodine. The relationship between the incidence of goiter and the lack of iodine is discussed. The results obtained support the belief that a low iodine intake is a prerequisite for the production of goiter. Including in their survey the determinations made by other workers on the daily urinary iodine excreted in goitrous and nongoitrous regions, the authors conclude that the critical level of iodine intake sufficient to prevent goiter is between 120γ and 160γ per day. The level of iodine intake was found to be low in the districts surveyed. The studies in New Plymouth and Taranaki indicate that a high content of iodine in the soil does not necessarily ensure an adequate iodine intake. Recommendations for improving the regulations as to the sale and use of iodized salt are outlined.

Lactobacillus acidophilus in dental caries, M. M. Johnston, C. H. M. Williams, P. G. Anderson, T. G. H. Drake, F. F. Tisdall, and M. J. Kaake (*Jour. Amer. Dental Assoc., 23 (1936), No. 8, pp. 1493–1497*).—This study was undertaken to determine whether *L. acidophilus* is a specific etiologic factor in dental caries. Bunting and his associates, who had previously reported that in active caries there is a significant growth of *L. acidophilus* which is not found in the absence of active lesions (E. S. R., 70, p. 571), cooperated in this study.

Throughout 1 yr. bacteriologic cultures of the mouth were taken from a group of 39 children. Careful clinical and roentgenologic dental examinations were made independently at the beginning and end of the year by both groups of workers with identical results. Nine children in the group had progressive dental caries, 1 marked and 8 slight cases. Among the group exhibiting progressive caries, *L. acidophilus* was continuously absent in 2 cases. In 27 cases with no evidence of progressive caries, *L. acidophilus* was continuously present in only 1 case. In this group *L. acidophilus* was sporadically present in 8 cases, but infrequently in 7 of these cases. No agglutinins, precipitins, or inhibitory bodies for *L. acidophilus* were found in the saliva samples of negative cases.

Symposium on nutrition and the deficiency diseases (*New England Jour. Med., 215 (1936), No. 25, pp. 1147–1168, figs. [4]*).—This symposium, held at the tercentenary session of the Harvard Medical School on September 14, 1936, consisted of the following papers: Harvard and Nutrition, by G. R. Minot (pp. 1147–1149); Extracellular Fluid and Its Maintenance, by J. L. Gamble (pp. 1150–1152); Protein Deficiency, by C. M. Jones (pp. 1152–1155); Mechanism of Hemoglobin Deficiency, by C. W. Heath (pp. 1155–1157); The Relationship of Defective Nutrition to Changes in the Gastrointestinal Tract, by W. B. Castle (p. 1158); Vitamin C and the Formation of Intercellular Material, by S. B. Wolbach (pp. 1158, 1159); Progress in the Early Recognition of Vitamin Deficiency States, by K. D. Blackfan (pp. 1159–1163); The Relation of Avitaminosis to Oral Pathology, by P. R. Howe (pp. 1163, 1164); Nerve Disorders Arising From Defective Nutrition, by M. B. Strauss (pp. 1164–1166); and Protamine Insulin and Its Advantages, by E. P. Joslin (pp. 1166–1168).

Diseases of metabolism and nutrition, I, II (*Arch. Int. Med., 57 (1936), No. 2, pp. 422–471, fig. 1*).—This review consists of two parts as follows:

I. *Diseases of metabolism*, R. M. Wilder (pp. 422–446).—This part of the review deals almost exclusively with the recent advances made in the study and treatment of diabetes mellitus and associated disorders and diabetes insipidus.

II. *Nutrition*, D. L. Wilbur (pp. 446–471).—Recent progress in the study of the vitamins, the discussions on calcium, phosphorus, iron, and copper metabolism and dental caries, is summarized.

Susceptibility of different strains of rats to nutritional cataract, H. S. MITCHELL (*Jour. Nutr., 12 (1936), No. 5, pp. 447–453, fig. 1*).—Casual observations of various investigators suggesting differences in the susceptibility of various strains of rats to nutritional cataract on diets high in lactose or galactose (E. S. R., 74, p. 418) led the author to make further observations at the Massachusetts Experiment Station on the response of several different strains of rats to diets containing, respectively, 70 percent of lactose, 35 of galactose, and 70 percent of starch as the carbohydrate source.

In rats of the Battle Creek strain, in which the condition was first noted by the author, cataract developed in 82 percent of the 52 males studied and in 89 percent of the 46 females, while in rats of the Michigan State College strain the incidence was only 10 percent of 10 rats and of the Wistar strain 9 percent of 11 rats. The average lengths of time for the development of mature cataract were 44, 45, 56, and 97 days, respectively.

On the 35-percent galactose diet there was a 100 percent incidence of cataract in the Battle Creek and Michigan College strains, but only 60 percent among 10 animals of the Wistar strain and 83 percent among 15 of the Johns Hopkins strain. The number of days required for the development of mature cataract in five groups were 16, 17, 32, 29, and 23 days, respectively. On diets containing 70 percent of starch no cataracts developed.

Growth was normal on the galactose but slightly retarded on the lactose diet. There was no apparent diarrhea or intestinal disturbance in the rats on the 35-

percent galactose diet and a more or less severe diarrhea on the lactose diet. The severity of the intestinal disturbance, however, showed no correlation with the cataractous changes.

It is noted that cataract development is more rapid in young rats than in older ones, and consequently the age at which the animals are started on the experimental diets must be kept constant if results are to be consistent.

TEXTILES AND CLOTHING

The technology of washing, J. T. Holden and J. N. Vowler (*London: Brit. Launderers' Res. Assoc., 1935, pp. VII+184, figs. 7*).—This volume, with a preface by F. C. Harwood, is compiled for use by laundry executives and technologists and deals with the problems of the wash house. The material was gained from research studies made by the authors and others and from technical reports issued by the British Launderers' Research Association. The subjects discussed include white-work washing processes, bleaching, bluing, starching, the use of acids, laundering of woolens and silks, processes for colored goods and special goods such as curtains, stain removal, and water treatments. The appendix contains information on instruments in the wash house, water and bleach testing (with a list of the chemical solutions and apparatus required), and an index of the laundry supply houses.

Research groups study peroxide clarifier, J. F. Oesterling and P. B. Mack (*Laundry Age, 16 (1936), No. 5, pp. 14, 16, 87, figs. 4*).—The authors at the Pennsylvania State College studied the efficiency of hydrogen peroxide as a bleach in the laundry process. The results of the tests show that when correct bleaching conditions are maintained hydrogen peroxide is as good as chlorine bleach for whiteness retention and stain removal, and it causes less general damage to the strength of cotton fabrics. The best conditions for bleaching are pH 9.0–9.5 when used with a carbonate type of alkali and pH 10.0–10.5 when used with sodium metasilicate, a temperature not in excess of from 150° to 160° F., and a concentration between ⅔ and 2 qt. of hydrogen peroxide, containing 1 percent of available oxygen, to each 100 lb. of fabric.

More about bleaching, J. F. Oesterling and P. B. Mack (*Laundry Age, 16 (1936), No. 6, pp. 58, 60, 62, 64, figs. 2*).—Continuing their studies, as noted above, the authors discuss the chemistry of bleaching and review their research studies on bleaching reagents. Eighteen squares of cotton fabric, containing different stains, were assembled into a composite strip. Sample strips were treated in the laboratory with chlorine bleach and with hydrogen peroxide bleach separately. Stain removal tests were made in commercial laundry plants, using chlorine, hydrogen peroxide, and sodium perborate bleaches. In both laboratory and plant tests the stains used were beverages, fruit juices, inks, salve, iron rust, hair lotion, dye, grass, blood, iodine, and huckleberry.

The results of the commercial plant tests were almost identical, and it was concluded that equally good stain removal efficiencies can be obtained with the three bleaches if good bleaching conditions are maintained and a correct washing procedure is followed. Based on the results of the laboratory and plant tests, the optimum conditions for chlorine bleaching are as follows: The use of 2 qt. or less of sodium hypochlorite solution, containing 1 percent available chlorine, per 100 lb. of fabric, a temperature not in excess of 150°–160° F., a pH of 10.0–10.5, and a time period of 10–15 min. The optimum conditions for hydrogen peroxide bleaching are given in the preceding paper. A special type of blue which will wash out with soap and alkali is used with hydrogen peroxide bleach. The temperature should be lowered when bleaching

colored fabrics, particularly those containing fugitive dyes, with hydrogen peroxide. The pH should not exceed 9.0–9.5 when hydrogen peroxide is employed in the bleaching of silks and woolens.

HOME MANAGEMENT AND EQUIPMENT

Housewifery: A textbook of practical housekeeping, L. R. Balderston (*Chicago: J. B. Lippincott Co., 1936, 5. ed., rev., pp. XI+352, [pls. 2], figs. 174*).—This edition of the handbook of practical housekeeping (E. S. R., 41, p. 97) contains extensive references to recent scientific and technical material and presents new illustrations, technics, and equipment.

MISCELLANEOUS

Application of statistical methods to agricultural research, H. H. Love (*Shanghai: Commercial Press, Ltd., 1936, pp. [IX]+501, figs. [34]*).—This book sets forth the fundamentals of statistical analysis, including the application of the experimental error concept and the method of variance analysis.

Statistical methods for research workers, R. A. Fisher (*Edinburgh: Oliver & Boyd, 1936, 6. ed., rev. and enl., pp. XIII+339, figs. 12*).—The revised edition of this book (E. S. R., 74, p. 179) includes new tests for homogeneity, sampling errors estimated by regression, and the extended use of successive summation in fitting polynomials.

Forty-ninth Annual Report, Colorado Experiment Station, [1936], E. P. Sandsten (*Colorado Sta. Rpt. 1936, pp. 44, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report [of Texas Station], 1935, A. B. Conner et al. (*Texas Sta. Rpt. 1935, pp. 294*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Fifty years of field experiments at the Woburn Experimental Station, E. J. Russell and J. A. Voelcker (*London and New York: Longmans, Green & Co., [1936], pp. XVII+392, pls. [4], figs. 42; rev. in Nature [London], 139 (1937), No. 3509, pp. 171, 172*).—This book is discussed editorially on page 433.

NOTES

Kansas College and Station.—A new physiological laboratory has been fitted up for the veterinary division which provides greatly improved facilities.

Herbert F. Roberts, head of the department of botany from 1901 to 1919 and subsequently assistant professor of botany in the University of Manitoba, died January 15 at the age of 76 years. He was a native of Kansas, receiving the A. B. degree from the university in 1891 and the M. S. degree from the college in 1898. From 1910 to 1919, he was in charge of experimental plant breeding in the station. In the words of a recent tribute in *Kansas Industrialist*, he had a world-wide reputation as "a botanist and plant breeder, taking part in the development of Kanred wheat and several other strains of Kansan wheats well suited to the Great Plains wheat belt."

Kentucky University and Station.—New buildings have been authorized for the coming year to cost $1,093,000. Among the new structures is a home economics, bacteriology, and zoology building to cost $185,000.

H. H. Thornberry, assistant plant pathologist, resigned December 31, 1936.

Massachusetts College.—Kenneth C. MacArthur has been appointed assistant professor of rural sociology.

Nebraska University and Station.—Lawrence Bruner, connected with the entomological work of the institution from 1888 to 1921, since 1895 as professor of entomology, died January 30, aged 80 years. A native of Pennsylvania, he received the honorary B. S. degree from the university in 1897. He had specialized on orthopteroid insects, particularly the locusts, which he studied extensively in Argentina and other South American countries.

Cornell University.—Cyrus R. Crosby, extension professor of entomology since 1913, died January 11 at the age of 58 years. A native of New York, he was graduated from the university in 1905 and subsequently continuously identified with its instruction and extension work.

Virginia Station.—Dr. A. L. Grizzard, associate agronomist, resigned December 31, 1936. Dr. W. L. Threlkeld, assistant professor of zoology, has been appointed assistant zoologist, and A. G. Smith, Jr., associate horticulturist.

New Journals.—*The Journal of Marketing* is being issued quarterly at 383 Madison Avenue, New York City. It succeeds *The National Marketing Review* and *The American Marketing Journal* as the result of a merger on January 1, 1937, of the American Marketing Society and the National Association of Marketing Teachers into the American Marketing Association. The initial number contains book reviews, notes, and a number of original articles, among which are the following: The Consumer and the Agricultural Adjustment Administration, by D. S. Anderson (pp. 3–9); Notes on the Measurement of Consumers' Attitudes, by H. K. Nixon (pp. 13–19); Where Are We Bound in Marketing Research? by F. R. Coutant (pp. 28–34); Market Research in Germany, by K. Brandt (pp. 35–39); and Progress in Marketing Research, by M. D. Taylor (pp. 56–64).

Rivista di Parassitologia is being published quarterly at Via G. B. Martini 6, Roma, chiefly for original contributions in protozoology, helminthology, and entomology. All articles in the initial number are in Italian, but a distinctive feature is the inclusion of English and German summaries.

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EXPERIMENT STATION RECORD

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THE DEATH OF BLACKWELL OF OKLAHOMA AND NIELSON OF NEW JERSEY

Agricultural experiment stations, like other research institutions, rely for their success primarily on the faithful and efficient labors of the men and women associated with them. Their organization is more or less complex, and they are served in various ways. To them, of course, the investigator is fundamental, but administration and support are also vital, and when these are effectively rendered the gain to the stations and to the world is great.

These observations are put forward at this time because of two recent losses from the station ranks. One of these was Director Carl P. Blackwell of Oklahoma, who died in his fifty-first year on March 4, 1937. The other, on February 19, was Mr. James Nielson, 92 years of age, active in the founding of the New Jersey Experiment Station in 1880 and continuously thereafter a member of its governing body.

Director Blackwell was born in Lampasas, Tex., on November 5, 1886, reared on a farm, and graduated from the Oklahoma A. and M. College in 1911. Aside from an interlude of study at the University of Wisconsin leading to the M. S. degree in 1915 and an assistantship in field crops in Cornell University in 1917–18, his life was spent in the South. Beginning as instructor and adjunct professor in agronomy in the University of Texas (1914–17), he became in turn professor of agronomy in Clemson College and agronomist in the South Carolina Station (1918–25), agronomist of the soil improvement committee of the National Fertilizer Association (1925–28), and dean of agriculture and director of the station in Oklahoma since 1929 (with leave of absence in 1935 as regional director of the land utilization section of the U. S. Resettlement Administration).

The personal contribution of Director Blackwell to research was restricted mainly to his creditable service as an agronomist. As an administrator he had demonstrated his effectiveness under difficult conditions. His initial report from Oklahoma deplored the frequent previous changes in personnel, and he had made definite progress in the task of stabilization and improvement to which he had pledged himself. His research program made substantial provision

for basic studies, but was also fully cognizant of immediate needs. He was notably successful in increasing the contacts of the station with the people of the State, one effective medium being the attractive and informing series of reports which he issued under the titles of Research Leads to Farm Progress, Solving Oklahoma Farm Problems, *Applying Science to Agriculture*, and Science Serving Agriculture. He was highly regarded throughout the South, and of increasing influence in the Association of Land-Grant Colleges and Universities, serving as secretary and chairman of its experiment station section in 1933 and 1934. Occurring at a time when many years of usefulness seemingly lay before him, his death has ended a career of considerable accomplishment and much promise.

The long life of Mr. Nielson was closely identified with a single institution—Rutgers College. Graduating there in 1866, he continued his residence in New Brunswick and his association with Dr. George H. Cook, who had recently been appointed professor of the theory and practice of agriculture. In 1870 and again in 1878, these two made extensive visits to Europe, studying agricultural institutions and bringing back with them seed of the soybean from Bayern (Bavaria) and Wien (Vienna) as well as plans for assisting agriculture by organized experimentation. Eventually their efforts in the latter direction were rewarded by the establishment in 1880 of the New Jersey State Experiment Station. Two years previously Mr. Nielson had been appointed a member of the board of visitors of the College of Agriculture, and thereby he then became one of the board of managers of the station. He was soon elected secretary and treasurer. Thereafter his interest was unfailing and his services as varied as were the needs.

In 1883 he helped to defeat a bill to repeal the act creating the station. He gave a plot of ground as a site for the station building, and later made gifts and loans of additional land and purebred stock. Upon the death of Dr. Cook he served as acting director for more than 2 years, leaving the station in 1893, in the words of its history, "in spite of uncertainty and lack of a long-time program . . . a stronger institution than he found it." In 1910 he was appointed vice president of the board of managers and in 1913 president, serving in the latter capacity for nearly 25 years.

Mr. Nielson also generously aided other branches of Rutgers, endowing the College for Women and giving the Nielson campus and athletic field. His sustained interest was reattested by his will, leaving $50,000 as a student loan fund to the College for Women and his entire residuary estate, estimated at $500,000, to the university. Characteristically self-effacing and never patronizing, he was a true patron of education and agriculture.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical research work of the Bureau of Chemistry and Soils, 1936] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1936, pp. 3–29*).—The carbohydrate investigations have included work on sugarcane and cane sugar, sugarcane sirup, sorgo sirup, beet sugar, honey, milk-sugar products, levulose and arabinose. and sweetpotato starch. In food research data were obtained on microbial food spoilage, cucumber pickles, wines and fruit brandy, staling of bakery products, waxlike coatings of fruits, toxicity of fluorine compounds and other insecticides, rancidity, lecithin in soybeans, special breads, egg preservation, plant pigments, apple powder and other deciduous fruit products, loosening the hulls of walnuts, citrus fruit products, enzyme studies, and preservation of fruits and vegetables by freezing. The industrial farm products research has included work on cellulose, utilization of farm wastes by destructive distillation and by fermentation, lignin, mold fermentation products from corn sugar, chemical weed killers, fast dyes for agricultural fibers, biological stains, mildew-proofing of farm fabrics, preservatives for hides and skins, tanning materials, and leather. Under naval stores research are considered the topics chemistry of turpentine and rosin and the technology of naval stores. The oil, fat, and wax investigations dealt with black-walnut oil, raisin-seed oil, tung and other drying oils, miscellaneous seed oils, and halibut-liver oil. The protein and nutrition investigations covered the digestibility of proteins; cystine, tryptophan, and tyrosine content of proteins; proteins in locust bark; safflower-seed meal; amino acid content of wheat; and selenium in toxic wheat.

[Chemical and bacteriological investigations by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 14, 15, 16, 22, 23, 24*).—The report contains brief notes on the following topics: Cucumber fermentation, yeast studies, a micromethod for the determination of lead, analysis of sugar beets and Michigan wheats and flours, methods for the determination of potassium and sodium, copper, and fluorine, and bacteriological methods of water analysis.

[Chemical and bacteriological researches of the New York State Station] (*New York State Sta. Rpt. 1936, pp. 18, 19, 26, 36–38, 40, 41, 46, 47*).—Notes are given on the following topics: Fruit juice preservation, sauerkraut investigations, identification of yeasts, bacteria causing lactic fermentations, fruit juices (including grape juice, rhubarb juice, apple juice, and cherry juice), fermented fruit juices, pectin and pectic enzymes, new analytical reagents for sodium and potassium, protein investigations (including casein plastics and influence of salts on the properties of gelatin).

The refractivity of protein solutions, D. B. Hand (*Jour. Biol. Chem., 108 (1935), No. 3, pp. 703–707*).—A contribution from Cornell University calls attention to the fact that in the equation for the refractive index of a protein solution, $n_{ps} - n_s = a \times C$, in which n_{ps} is the index for the protein solution, n_s is the index for the solvent, C is the concentration in grams per 100 cc of

solution, and a is a proportionality constant, sometimes called the specific refractive increment, "the proportionality constant has been erroneously considered by all authors as being characteristic of the individual proteins. . . .

"Although a is not characteristic of the individual protein, it is possible to write equation 1 [above stated] in a form in which a characteristic constant does appear and which is independent of the refractivity of the solvent. If we assume that equation 1 is valid for solutions of all concentrations, we can extrapolate to solutions containing only protein. At this point the refractivity of the solution, n_{ps}, would be equal to the refractivity, n_p, of the pure protein in the dissolved state, and the concentration would equal 133 g of protein per 100 cc (density of protein is 1.33). Then, from equation 1, $n_p - n_s = 133a$ and $a = (n_p - n_s)/133$ [equation] (2).

"It is an experimental fact that a varies with the refractivity of the solvent and that the calculated values of n_p are independent of the solvent in many instances and are characteristic of the individual protein. . . . Although the values for a vary greatly from solvent to solvent, the extrapolated figure for pure protein in solution, n, is practically independent of acid, alkali, sodium chloride, and ammonium sulfate. However, alcohol and acetone actually decrease the refraction of serum globulin, increase slightly the refraction of casein, and have no effect on the refraction of gliadin. Phenol depresses the refraction of gliadin markedly. It is possible that these solvents dehydrate the protein so that the refractivity shifts toward that of the dry protein. This seems the more likely since dry protein has a different density from dissolved protein. The values of n_p are probably accurate to ±0.01."

It is emphasized that "no physical significance should be attributed to n_p. We have no data which would justify extrapolation beyond the small range of concentrations which have been studied experimentally. The fact that n_p is a constant characteristic of the protein does not prove the validity of the assumption used in deriving equation 2. The value n_p is proposed as an empirical convenience for describing the rate with which the refraction of protein solutions changes with concentration when the refractivity of the solvent is taken into consideration."

Glutamine and asparagine in tobacco leaves, H. B. Vickery and G. W. Pucher (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 157–160*).—In an investigation carried out at the Connecticut [New Haven] Experiment Station it has been shown that glutamine occurs, together with asparagine, in considerable quantities in the leaves of the tobacco plant, an observation which furnishes an explanation of the production of ammonia when tobacco plant tissue is treated with boiling water. It is pointed out, however, that "this observation does not exclude the possibility that other amides, or amidelike substances, may also be present", and the importance to the understanding of the amide metabolism of plants of further qualitative study is emphasized.

The component fatty acids of goat milk fat, R. W. Riemenschneider and N. R. Ellis (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 219–233, fig. 1*).—At the U. S. D. A. Bureau of Animal Industry, a composite sample of fat from goat milk, amounting to 3.5 k, was converted to methyl esters and fractionated into 63 fractions for determination of the component fatty acids.

A study of the distillation data indicated the presence of decenoic, tetradecenoic, palmitoleic, oleic, caproic, caprylic, capric, myristic, palmitic, and stearic acids. Subsequent examination of the fractions established the presence of these acids and also of arachidonic acid. Traces of an octabromide of an unknown acid were found (probably a C_{22} acid or an impure isomer of arachidonic acid). A mixture of saturated acids with higher molecular weight than stearic acid was isolated, consisting principally of tetracosanoic acid along

with traces of cerotic acid. Estimations on the content of the component fatty acids present show general agreement with previously published analyses except for the absence of linoleic acid and the presence of small percentages of decenoic, tetradecenoic, and hexadecenoic acids.

Some products of partial hydrolysis of silk fibroin, R. L. Grant and H. B. Lewis (*Jour. Biol. Chem., 108 (1935), No. 3, pp. 667–673*).—The authors subjected silk to hydrolysis at 30° C. with 70 percent sulfuric acid for from 65 to 70 min. and studied the products of hydrolysis.

"It has been possible to obtain two peptones of widely different composition. The first had a low amino nitrogen content and a content of tyrosine higher than that of the original silk. The second contained more amino nitrogen (10 to 17 percent of the total nitrogen) and tyrosine in amounts similar to many of the more common types of proteins (2.5 to 5.7 percent)."

Enzymatic hydrolysis of starch in pectic extractions from apple pomace, G. L. Baker (*Delaware Sta. Bul. 203 (1936), pp. 21, 22*).—The author reports results of further experiments (E. S. R., 74, p. 4).

The purification and properties of lysozyme, K. Meyer, R. Thompson, J. W. Palmer, and D. Khorazo (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 303–309*).—The authors report upon a study of the preparation of the bacteriolytic principle, lysozyme, from acetone-dried egg white.

"Lysozyme can best be freed from the tenaciously adhering mucoid in the extracts by precipitation with flavianic acid. Lysozyme is apparently a basic polypeptide, having a nitrogen content of 15.3 percent and giving a number of protein reactions. From the presence of sulfhydryl, its inactivation by alkali, peroxide, iodine, and cuprous oxide, and its reactivation by hydrogen sulfide, sulfite, and hydrogen cyanide, it is concluded that lysozyme acts only in the reduced state."

Purification of the antihemorrhagic vitamin, H. J. Almquist (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 241–245*).—This contribution deals with the purification and concentration of the antihemorrhagic vitamin as contained in a hexane extract of alfalfa meal, with a brief summary on the known properties of this product.

Purification of the antihemorrhagic vitamin by distillation, H. J. Almquist (*Jour. Biol. Chem., 115 (1936), No. 2, pp. 589–591*).—Dealing with the antihemorrhagic vitamin concentrate as described above, a method is given for further concentration and purification of the product by distillation under a high vacuum. A distillate fraction of yellow oil obtained at 120°–145° was found to be at least four times as potent as the original concentrate. The requirement of the chick is not more than 0.5 μg (microgram) of this product per gram of diet.

Provitamin D potencies, absorption spectra, and chemical properties of heat-treated cholesterol, M. L. Hathaway and F. C. Koch (*Jour. Biol. Chem., 108 (1935), No. 3, pp. 773–782, pls. 2*).—Detailed experimental evidence obtained at the University of Chicago shows that although the fractionation methods used are "far from quantitative", the authors have been able to obtain from heat-treated cholesterol crude fractions of different provitamin D activities, depending on the temperature and time of heating and the solvent used.

Effect of sulfur sprays on corrosion of prune cans, E. H. Wiegand, D. E. Bullis, and M. B. Hatch (*Oregon Sta. Bul. 345 (1936), pp. 42, figs. 10*).—The quantity of sulfur introduced into the can by prunes that have been sprayed or dusted according to prevailing orchard practices was found to be less than 0.3 part sulfur per 1,000,000 parts of can contents). Corrosion caused by this minute amount of sulfur was confined principally to enameled and reenameled

coke-plate cans, in which cases failures were generally less for the washed than for the unwashed fruit. This study indicates that the amounts of spray materials when properly applied do not introduce into the cans sufficient residue to be a factor in causing corrosion. Corrosion in the various sprayed lots closely paralleled that observed in the respective control packs.

A marked benefit was obtained by using a better grade of plate. In all cases the "charcoal" plate was found superior to the "coke" plate. The two tin plates used were both coated on the same high-grade soft steel, but the coke plate had a light tin coating, whereas the charcoal plate had a heavier coating. In most instances the enamel on coke plate caused more rapid spoilage. This is tentatively attributed to intensively localized action on the tin and iron where defects occur in the enamel coating. Sirup packs tended to corrode more rapidly than the water packs.

"Sulfur compounds, with the exception of sodium sulfite, added directly to the can in larger amounts [10 p. p. m.] proved to be very active in producing corrosion. This is attributed to the relatively large quantities added compared to the amounts introduced through spraying."

A new and easy method for the potentiometric determination of calcium concentrations in solutions, H. J. C. Tendeloo (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 333–339, fig. 1*).—The author finds that CaF_2 electrode can be used at calcium concentrations of 1 milliequivalent per liter and higher to determine potentiometrically concentrations of calcium in solutions and in protein sols.

It was shown that calcium is adsorbed by proteins and that the adsorption decreases with increasing acidity of the protein sols.

It is pointed out that "the use of CaF_2 as an electrode provides the great advantage that no foreign substances are introduced into the systems to be studied, as is the case when electrodes of the second or third order are used."

Modifications of the bipyridine method for available iron, G. O. Kohler, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 49–53*).—At the Wisconsin Experiment station the bipyridine method (E. S. R., 64, p. 712) has been modified to render it applicable for the determination of available iron in pigmented plant tissues, and a further modification of the same method is applicable to fresh animal tissues. The figures obtained in the examination of a number of food substances are tabulated.

Determination of the mineral content of the soil absorbing complex, E. Truog and M. Drosdoff (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 92–95*).—A brief discussion contributed from the University of Wisconsin takes up separation of free silica, alumina, and ferric oxide; evidence indicating the presence of muscovite and talc in soil colloids; chemical composition of base-exchange compounds; and the mineral compounds of soil colloids. An "outline of procedure for determination of mineral content of inorganic soil colloid" is given under the subheads (1) separation and determination of free silica and free alumina, (2) separation and determination of free iron oxide, (3) removal of free sulfur introduced under (2), (4) determination of exchange capacity, (5) saturation of muscovite to normal potash content, (6) total analysis, and (7) stoichiometric allocations.

A method for the simultaneous determination of organic carbon and the "oxidation value" of soil organic matter, I. V. Tiurin (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 111–113*).—The author suggests that the volumetric chromate method for the approximate determination of organic carbon may be used to study the degree of oxidation of the soil organic matter by measuring simultaneously the amount of carbon dioxide

evolved. "If the carbon dioxide is equivalent to the amount of chromic acid reduced, then the corresponding organic matter may be assumed to have the composition $C_nH_{2m}O_m$. If more carbon dioxide is evolved the composition may be written $C_nH_{2m}O_{m+x}$ and, if less, $C_n2_{2m}O_{m-y}$. Provisionally we may assume that the first case corresponds to a normal degree of oxidation of the organic matter, and we may expect the differences between the carbon dioxide evolved (1) and the oxygen required from the dichromate (2) to show the nature of the soil organic matter and to characterize the conditions of its formation."

Some of the data obtained in this manner by the author are given.

First report of the Organic Carbon Committee, E. M. CROWTHER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 114–127*).—Nine soils were analyzed for organic carbon by several methods at 11 laboratories.

The dry combustion results by a number of methods gave such concordant results that the choice between these methods is probably to be made on the grounds of laboratory convenience. The removal of carbonates by repeated treatment with sulfurous acid solution gave results agreeing with those from separate determinations of total and inorganic carbon. In wet combustions the recoveries of carbon varied with the details of the technic. By one method the recoveries for eight soils fell between 99 and 103 percent, except for one calcareous soil which gave only 90 percent recovery. A number of rapid chromic acid or dichromate titration methods gave useful approximate results when corrected by an appropriate factor. Chlorides in two of the soils interfered seriously with many of the analyses.

Note on the amide nitrogen of some soils of the tropical regions [trans. title], M. RIGOTARD (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 108, 109*).—Noting that organic nitrogen is ordinarily determined only in its total quantity, with little or no attention to the amide fraction of the total organic nitrogen, the author emphasizes the possible significance of the last-named datum, outlines a provisional method consisting essentially in the extraction of the soil with 1 percent aqueous hydrochloric acid at room temperature and the determination, by the Kjeldahl method, of the nitrogen content of this extract, and gives the figures obtained in the examination of Cambodge, Cochinchina, and Annam soils. In the samples for which the data are here tabulated, the amide nitrogen was found to constitute from 13.9 to 28 percent of the total nitrogen.

A method for determining the degree of humification of the soil, W. SIBIRSKY (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 110, 111*).—As a reagent capable of dissolving the more completely humified portion of the soil organic matter and leaving the undecomposed substances intact, the author used a hypochlorite solution made by passing chlorine through N NaOH (1.040 sp. gr.) at 5° C. until the density reached 1.050 (5.5 l or 17.4 g chlorine per 500 cc N NaOH). Fresh solutions were used in the work described, "but the solutions may be preserved for periods up to 1 mo. by using paraffined vessels, closed by a stopper with a soda-lime tube, and stored in darkness at a temperature below 10°. Chlorates and a moderate alkalinity do not interfere with the methods.

"[A sample amounting to] 0.5 g soil is ground in an agate mortar, dried at 100°, and treated in a 150-cc beaker with 20 cc of water and 50 cc of the hypochlorite solution. Care must be taken to prevent loss by foaming. The mixture is heated on a boiling water bath for half an hour with stirring, and then boiled for 5 min. The residual hypochlorite is decomposed by neutralizing with concentrated hydrochloric acid, which is added drop by drop until effervescence stops and the solution clears. The beaker is allowed to stand in hot water until

the solution is completely clear, and the residue is transferred to a Gooch crucible and washed with hot water, containing a trace of nitric acid, until chlorides are completely removed. The crucible is dried to constant weight at 100°. The filtrate is concentrated to about 100 cc, neutralized with ammonia, and treated with 15–20 cc N $(NH_4)_2CO_3$ and, after the precipitate has settled, with N $(NH_4)_2C_2O_4$. After standing in a warm place the precipitate is filtered off, washed with hot water containing $(NH_4)_2CO_3$, and ignited. The weight of the precipitate is added to that of the treated soil and the total loss on oxidation determined. Soluble salts should also be determined if their amount is appreciable."

This method was found to give somewhat lower results than does the 6 percent hydrogen peroxide method, the last-named reagent having been found to oxidize more of the cellulose than does the hypochlorite reagent.

On the question of the determination of the "root-soluble" soil phosphoric acid by the citric acid method [trans. title], M. Gračanin (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 97–99*).—In view of the well-known fact that the solubility of phosphates in buffer solutions depends quite as much upon the H-ion concentration of the solution as upon the *titratable acidity of the organic acid, on the ground of other theoretical considerations and by reason of the results of comparative experiments on a number of soils the author concludes that the determination of "available" phosphoric acid by means of a 1 percent solution of citric acid has neither experimental nor theoretical justification.*

Report of the Soil Reaction Committee on the investigation of the glass electrode method, D. J. Hissink (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 127–132*).—The glass electrode method proved satisfactory on all soils tested. It was found that the agreement between the quinhydrone and the glass electrode methods is satisfactory for soils without quinhydrone drift, i. e., for soils which give closely similar potentials about 10 and 60 sec. after adding the quinhydrone. "For soils with quinhydrone drift the glass electrode results are similar to those measured by quinhydrone after about 10 sec. Such rapid measurements by quinhydrone are not reproducible, and for soils with large quinhydrone drifts the pH values should be measured by the glass electrode. In order to decide whether the quinhydrone method is appropriate, determinations should always be made rapidly (preferably within 10 sec.) and again after 60 sec., and the latter readings used when the drift is small."

The quantitative determination of chlorophyll by means of the photoelectric colorimeter of Lange [trans. title], T. N. Godnew and S. W. Kalischewicz (*Planta, Arch. Wiss. Bot., 25 (1936), No. 2, pp. 194–196, fig. 1*).—The authors briefly discuss the literature on quantitative determination of chlorophyll, and from their own experiments, three of which are here noted, they conclude that with the Lange colorimeter this may be done directly in acetone extracts with extraordinary rapidity and exactness.

The determination of some amino acids in crystalline pepsin, H. O. Calvery, R. M. Herriott, and J. H. Northrop (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 11–14*).—In a crystalline pepsin preparation the author determined total nitrogen, amino nitrogen (before and after acid hydrolysis), humin nitrogen, amide nitrogen, tyrosine, tryptophan, cystine, arginine, histidine, lysine, aspartic acid, and glutamic acid.

During heat coagulation at pH 4 there was partial destruction of the pepsin molecule, and "on analysis of the coagulated material and the noncoagulable material for the above substances differences were observed." Of amino nitro

gen determined after acid hydrolysis, of amide nitrogen, and of tyrosine, cystine, and arginine, the coagulum contained appreciably less than did the noncoagulable material. The lysine and glutamic acid figures, on the other hand, are higher in the case of the coagulum than in that of the noncoagulable material.

A method to determine small amounts of citric acid in biological material, G. W. Pucher, C. C. Sherman, and H. B. Vickery (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 235–245*).—At the Connecticut [New Haven] Experiment Station it has been shown that quantities of citric acid of the order 0.1 to 1 mg can be determined with an accuracy of ±5 percent by oxidation and bromination to form pentabromoacetone and conversion of this substance by means of sodium sulfide to a colored material that is suitable for estimation in the Pulfrich spectrophotometer. Data obtained in the application of the method to the analysis of blood, urine, feces, and of both animal and plant tissues are given.

Determination of free and combined cholesterol in bile, C. Riegel and H. J. Rose (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 117–124*).—A method for the determination in bile of from 0.5 to 5 mg of cholesterol (free and combined), which is "simple and accurate to ±5 percent", is described.

The determination of carotene and xanthophyll by a single distribution between liquid phases, S. W. Clausen and A. B. McCoord (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 89–104, figs. 2*).—A general theory for the quantitative estimation of two substances having the same color by a single distribution between two immiscible liquids is outlined. The conditions for the application of the theory to the analysis of mixtures of pure carotene and xanthophyll are established. The solvents between which carotene and xanthophyll were distributed most advantageously for the purposes of the method described were hexane and diacetone alcohol. Precautions which must be taken when other substances are present are given. The application of the method to the analysis of blood plasma and serum is detailed.

Estimation of vitamin A [trans. title], G. Balassa and G. Szántó (*Hoppe-Seyler's Ztschr. Physiol. Chem., 240 (1936), No. 1–2, pp. 29–32, figs. 2*).—The authors review the methods used for estimating vitamin A and show that the Rosenthal reaction (E. S. R., 72, p. 739), or their modification of it by omitting the guaiacol, can be used for the determination of vitamin A in concentrates. For matching the color produced, a 0.02-percent solution of the dyestuff "Parabraun Z extra" was satisfactory. This reaction cannot be used for determinations on tissue extracts since cholesterol gives a red color.

The quantitative determination of vitamin K.—I, F. Schønheyder (*Biochem. Jour., 30 (1936), No. 5, pp. 890–896, fig. 1*).—Continuing the investigation by Dam on the antihemorrhagic vitamin of the chick (vitamin K) (E. S. R., 74, p. 682), a test for its quantitative determination is described. This is a curative method, a unit of vitamin K being defined as the smallest daily dose of a test substance per gram of chicken given for 3 days which is able to reduce the *S* value from over 1,500 to 10. The *S* value is a quantitative expression of the degree of sickness of the animal based on the comparative concentration of a clotting agent required to clot diseased and normal bloods within a given time. The methods for drawing blood from the carotid artery, determining the coagulation time, and calculating the *S* value are described.

The occurrence and chemical nature of vitamin K, H. Dam and F. Cchønheyder (*Biochem. Jour., 30 (1936), No. 5, pp. 897–901*).—This contribution establishes green vegetables as particularly rich sources of vitamin K. With regard to the chemical nature of this vitamin, using extracts of hog-

liver fat, it is shown to be quite thermostable. Its potency is greatly reduced by cold saponification and completely destroyed by saponification. Continued exposure to light and air also greatly reduced its potency, although it is not determined whether this was due to the action of light or to rancidity. Acetone has proved to be a particularly good solvent for extraction of the product. Adsorption on aluminum oxide, calcium carbonate, or cane sugar proved effective methods of concentrating the vitamin.

Deterioration of book and record papers, T. D. Jarrell, J. M. Hankins, and F. P. Veitch (*U. S. Dept. Agr., Tech. Bul. 541 (1936), pp. 20, figs. 4*).—The authors made tests of the physical condition and determined some of the chemical constituents of papers ranging in age from 19 to 169 years and compared the results with those of like tests on a new record paper. Edges of pages were found in general to yield a water extract of lower pH value, to show a higher content of absorbed acidic sulfur compounds taken up from the air, and to have a lower bursting and folding strength than did the centers of the pages. The weaker papers showed slightly higher copper numbers. In general, the papers with the highest acidity, as indicated by the pH of the water extract, suffered the greatest deterioration.

"These findings emphasize the need of further research to devise means of preventing or retarding deterioration caused by the presence of excessive quantities of aluminum sulfate and/or by the absorption of acidic sulfur compounds from the air. Libraries, especially those in cities and near coal-burning plants, should be so constructed as to permit conditioning and purifying of the air with which they are supplied. On the other hand, the incorporation in paper of suitable materials, such as a basic filler, to neutralize or counteract acidic gaseous sulfur compounds as such compounds come into contact with the paper may, it seems reasonable to think, decidedly prolong the life and serviceability of valuable book and record papers."

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Advances and developments in weather forecasting, R. H. Weightman (*Jour. Franklin Inst., 222 (1936), No. 5, pp. 527–550, figs. 9*).—This article deals especially with the influence of the Bjerknes cyclone model, air mass analysis, and Petterssen's kinematical methods on weather forecasting.

The author says: "As we review the progress in forecasting, it is apparent that very definite and decided advances have been made since the World War due largely to the more complete and more numerous observations in the free air. The more complete understanding of the genesis and maintenance of the high and low pressure systems which we now think of in terms of air masses and interactions between them, together with a better knowledge of the physical processes involved in the causation of precipitation, has been aided in great measure by the introduction of the Bjerknes cyclone model and in the last several years by Petterssen's kinematical methods of forecasting the movement and changes in intensity of the pressure systems and fronts."

Long-period prediction of crop yields in Germany [trans. title], L. Göseле (*Ber. Verhandl. Sächs. Akad. Wiss. Leipzig, Math.-Phys. Kl., 85 (1935), No. 2, pp. 121–144, figs. 8; abs. in Jour. Landw., 84 (1936), No. 3, pp. 253, 254; Met. Ztschr. [Braunschweig], 53 (1936), No. 10, pp. 397, 398*).—The author concludes that from a statistical study of the relation of weather to crop yields over long periods, it may be possible in many cases to make long-time forecasts of yields of grain in Germany.

Weather and wheat yield in western Canada.—II, Influence of preseasonal precipitation on plot yields; III, Relation between precipitation and agricultural yield, J. W. Hopkins (*Canad. Jour. Res., 14 (1936), No. 6, Sect. C, pp. 229–244, fig. 1*).—In continuation of previous statistical studies (E. S. R., 73, p. 301), there was found to be "a significant relation between preseasonal precipitation and the yield secured from year to year on both the fallowed and stubble plots of a summer fallow-wheat-wheat rotation, above-average moisture being associated with increased yields. The annual yields of Marquis wheat from more fertile summer-fallowed varietal test plots were not, however, significantly correlated with preseasonal precipitation, nor was there any consistent relation between this weather factor and the relative yield of certain early, medium-early, and late-maturing varieties. The annual average yield of wheat per acre from 1916–34 in three central and in three southern crop districts of Saskatchewan and Alberta showed a significant positive correlation with the available statistics of rainfall between May 1 and July 31. Yields in the southern districts were also positively correlated with preseasonal precipitation, whereas those in the central districts were not. The degree of association (R=0.74, central; and 0.79, southern) was not adequate for the practical forecasting of annual production, but may be improved by refinements dependent on the accumulation of additional observational data."

Evaporation and rainfall studies in the northwest Minnesota lake region, J. C. Jensen (*Amer. Phil. Soc. Proc., 76 (1936), No. 5, pp. 747–759, figs. 5*).—The stated object of the study here reported was to determine, if possible, whether there are well-defined though small increases in the thunderstorm precipitation within a distance of 20 to 30 miles from water areas of considerable extent. The area selected for the study was the lake region in northeastern South Dakota and in the vicinity of Dawson, N. Dak. It was found that very considerable quantities of moisture are evaporated from lakes and ponds under hot-wind conditions. Such bodies of water can increase the relative humidity by 16 percent and the absolute humidity by 29 percent, at the same time lowering the temperature of the air 9° F., and may result in a considerable increase in precipitation.

The duty of rainfall for sugar cane, A. Gordon (*Sugar News, 17 (1936), No. 7, pp. 277–282, figs. 4*).—The importance of proper amount and distribution of rainfall in sugarcane production is pointed out. In tables and graphs it is shown that when the annual rainfall is about 100 in. or less sugarcane production is relatively high. On the other hand, when the annual rainfall is much higher than 100 in. the production is relatively low. When seasonal rainfall (November 1 to March 31) is less than 20 in. the production is relatively high, and when it is over 20 in. the production is relatively low. For purposes of crop prediction the seasonal rainfall may be taken instead of annual rainfall. In this way a prediction on crop production of the coming season is possible immediately after the milling season is over.

Frost warning experts go far afield to gather their prediction material, A. J. Connor and D. C. Archibald (*Country Life Brit. Columbia, 20 (1936), No. 10, pp. 9, 16*).—The frost-warning service recently set up in Canada is described.

Frost penetration in cultivated soil [trans. title], O. Franck (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 462, (1936), pp. 37, figs. 11; Eng. abs., pp. 35–37*).—Thickness and looseness of snow cover were found to be a decisive influence on the depths to which soil will freeze. Frost penetration was found to be deeper in sandy and peat soils than in clayey soils. Frost penetrated deeper in naked ground than in ground covered by vegetation,

and deeper in untilled than in tilled soils. It disappeared first in sandy soils, a little later in clayey soils, and last in peat soils. In naked soil it disappeared earlier than in soil covered by vegetation.

Monthly Weather Review [September–October 1936], (*U. S. Mo. Weather Rev., 64 (1936), Nos. 9, pp. 287–317, pls. 11, figs. 5; 10, pp. 319–350, pls. 9, figs. 5*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 9.—Precipitation on the Islands Along the Chinese Coast, by J. Lee (pp. 287–291); Climate of the Rogue River Valley, Oreg., by W. B. Merriam (pp. 291–294); Gall's Projection for World Maps, by I. R. Tannehill and E. W. Woolard (pp. 294–297; and Tropical Disturbances, September 1936, by I. R. Tannehill (pp. 297–299).

No. 10.—Methods of Evaluating Ultra-Violet Solar Radiation in Absolute Units, by W. W. Coblentz (pp. 319–321); The Geometrical Theory of Halos, I, by E. W. Woolard (pp. 321–325); Wind and Minimum Temperature in the Redlands, California, Fruit-Frost District, by J. Janofsky (pp. 325–329); and Tropical Disturbance, October 9–10, 1936, by I. R. Tannehill (p. 329).

Meteorological observations [1936], C. I. Gunness et al. (*Massachusetts Sta. Met. Ser. Buls. 565–576 (1936), pp. 4 each*).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1936 which shows that the mean pressure for the year was 30.02 in.; the mean temperature 47.9° F., as compared with the normal of 47.2°, highest 98° July 8, lowest —12° February 20; total precipitation 48.24 in., as compared with the normal of 43.49 in., snowfall 47.5 in., as compared with the normal of 48.38 in.; mean cloudiness 52.7 percent, bright sunshine 55.4 percent; last frost in spring May 22, first in fall September 26; last snow April 2, first November 24.

Eight-year temperature variation [trans. title], F. Hummel (*Gerlands Beitr. Geophysik., 48 (1936), No. 2–3, pp. 268–302, figs. 14; Eng. abs., p. 268; abs. in Sci. Abs., Sect. A—Phys., 39 (1936), No. 466, p. 1073*).—A study of observations during 40 yr. at Karlsruhe, checked by observations during 134 yr. at Berlin, indicates an 8-yr. period of variations in frequency of frost days in March, the amplitude of which appears to vary with a period of 68–70 yr. and to be connected with the number of sunspots.

Meteorological and phenological observations in the Horo Experimental Forest, 1935 (*Saghalien Cent. Expt. Sta., Ann. Rpt. Met. and Phenol. Observ. Horo Expt. Forest, 5 (1935), pp. [6]+55*)—Observations under spruce-fir cover and in the open showed the mean air temperature in winter to be slightly higher in general under cover than in the open. During the rest of the year it was cooler, although the annual mean temperature was nearly the same. Monthly means of maximum air temperature were slightly lower under cover than in the open, but minimum air temperatures were somewhat higher. The annual temperature range was 2° C. less under cover than in the open. The mean annual relative humidity was 4 percent higher under cover than in the open throughout the year. Summer precipitation and evaporation under cover were about two-thirds and one-third, respectively, of those in the open, and wind velocity in summer under cover was as low as one-eighth of that in the open.

[Agricultural meteorology in India], C. W. B. Normand (*India Met. Dept. Rpt. 1934–35, pp. 16–18, pl. 1; abs. in Nature [London], 138 (1936), No. 3480, p. 70*).—Researches carried on in 1934–35 (E. S. R., 74, p. 8), especially under

the auspices of the Central Agricultural Meteorological Observatory situated on the farm of the Agricultural College, Poona, are reviewed. These "included precision observations on the growth of wheat and on the study of the microclimate of that crop . . . and a study of (1) the microclimate within the first few feet above the ground in the open, (2) the microclimate inside crops, (3) the thermal balance at the surface of the ground, (4) evaporation from soil and free water surfaces, (5) radiation from the sun, the sky, and the earth's surface, (6) soil temperature in relation to soil color and moisture at the surface and lower depths, (7) percolation of water through different depths of soil, (8) exchange of moisture between air and soil during clear weather, and (9) meteorological factors in relation to incidence of frost during winter in India." *Statistical studies of the relation of weather to yields of wheat, cotton, and other crops are also referred to, as well as effective rainfall and meteorological factors involved in weather forecasting.*

SOILS—FERTILIZERS

[Bureau of Chemistry and Soils soil and fertilizer investigations] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1936, pp. 32–45*).—The fertilizer investigations included work on nitrogen (catalysis in nitrogen fertilizer investigations, physical constants of gases and fertilizer salts, nitrogenous fertilizer materials, and biochemical and organic nitrogen investigations), potash production, phosphates, and mixed-fertilizer technology. Data are also given on selenium investigations, soil colloid investigations, nonfertile soils, soils from erosion experiment stations, peat and muck investigations, and the soil survey.

[Soil work of the Arkansas Station] (*Arkansas Sta. Bul. 337 (1936), pp. 26–29*).—Soil work is discussed by R. P. Bartholomew under the heads, availability of rock phosphate and the role of potassium, and erosion control by Bartholomew, D. C. Carter, L. C. Kapp, and W. C. Hulburt.

[Soil investigations by the Delaware Station] (*Delaware Sta. Bul. 203 (1936), pp. 14–16, 22, 41, 42*).—Very brief summaries are given on the influence of lime on the availability of potash, by H. C. Harris; the effect of fertilizers and cropping upon the nature and amount of electrodialyzable bases in the soil with particular reference to potassium, by G. M. Gilligan; and copper sulfate as a plant nutrient, by T. F. Manns, R. Russell, and W. Churchman.

[Fertilizer investigations by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 49–51*).—Concise summaries are presented under the headings fertilizer increases Upper Peninsula crops, grass responds earlier to mineral than to organic nitrogen, fertilizer placement, spring fertilization of fall grains, and effect of fertilization on leaf surface of beans.

[Missouri soil and fertilizer investigations] (*Missouri Sta. Bul. 370 (1936), pp. 75–81*).—Results are given briefly on fertilizers for cotton, soil erosion, the productivity of Missouri pastures, and rotation and fertilizer experiments, Sanborn field and south field, all by M. F. Miller and H. H. Krusekopf; nitrogen and carbon accumulation in the soil, by Miller, W. A. Albrecht, and H. Jenny; aggregation of desert and brown forest soils, and factors contributing to the genesis of soil microstructure, both by L. D. Baver; surface behavior in the hydration of clays and swelling of colloidal aluminosilicates, both by Baver and H. Winterkorn; calcium content of soils and the effect of long continued soil treatments upon bacterial activity, both by Albrecht; and base exchange and stability of colloidal systems, by Jenny and R. F. Reitemeier.

Soil survey of Wheeler County, Texas, A. H. Bean et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1932, No. 10, pp. 34, figs. 3, map 1*).—Wheeler County consists of 585,600 acres of "a rolling and hilly,

quickly drained, sandy plain which, in many places where the surface is unprotected, is subject to severe erosion by water and wind. The surface relief is featured by many short drainageways, large dunelike areas, and bodies of severely eroded soils."

The soils studied were found to form 13 series, including 19 types, of which Abilene loamy fine sand, 22.3 percent of the total area of the county, is the most extensive. Miles fine sandy loam covers 20 percent and Miles fine sand 17.1 percent.

Selenium occurrence in certain soils in the United States, with a discussion of related topics.—Second report, H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 530 (1936), pp. 79, figs. 10*).—The present bulletin summarizes the work of 1935 in continuation of that noted previously (E. S. R., 74, p. 102).

The existence of large areas of land containing sufficient selenium to produce toxic vegetation in the area surrounding the Black Hills, in western Colorado, in portions of the valleys of the Uncompahgre, Gunnison, and Colorado Rivers, in a portion of western Kansas, and in certain portions of Montana has been demonstrated. The data show that in these seleniferous areas not all the vegetation is toxic and that the degree of toxicity varies within wide limits for given plants, even for soils of similar selenium content, and also for different plants upon the same soil; that irrigation, with underdrainage, tends to diminish the selenium content of the soil; and that, if the irrigation water contains sulfates, irrigation diminishes the selenium content of the vegetation.

Data indicating a close relationship between the selenium content of soil and of the soil parent material are presented. "The parent material so far demonstrated as producing toxic soils appears to be limited to the lower portion of the Pierre and the upper portion of the Niobrara formations and the corresponding Cretaceous formations named otherwise. It is not asserted that toxic conditions are limited to these formations."

A photoelectric method for mechanical analysis, E. G. Richardson (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 40, 41*).—The "constant time" and "constant depth" methods here noted have been more fully noted from another source (E. S. R., 73, p. 15).

The effect of temperature in the mechanical analysis of soils [trans. title], M. Gračanin (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 34–38*).—The author shows that temperature has an important influence upon the sedimentation and dispersion processes in the mechanical analysis of soils, that when ammonium hydroxide is used as the dispersing agent the sedimentation rate and the dispersion are both increased but are not equally affected, and that as a result mechanical analyses of soil are comparable only when carried out at a single and constant sedimentation temperature and with the use of the same method for the preparation of the soil for analysis.

Results given by the citrate method for the mechanical analysis of soils and sediments [trans. title], A. Demolon and E. Bastisse (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 33, 34*).—The authors have developed, for the determination of the clay fraction, a method dependent upon the peptizing action of the citric anion, using a sodium citrate solution containing 10 milliequivalents per liter. Comparing this procedure with the International method, they obtained the same results in the examination of Podzols, Brown soils, slightly calcareous Red soils, soils having but slightly alterable skeleton of granitic origin, muds, alluviums, and plastic clays.

In calcareous sediments, however, the citrate method gave results lower than those given by the standard method. The authors found that in this case the solution of the calcium carbonate sets free colloids not preexistent

in the soil and not properly to be considered a part of the clay fraction of the soil in its natural state. The authors applied the International method to the residue remaining after an extraction of the colloids by the citrate method from a Limagne soil having andesitic skeletal material and obtained a significant further colloidal fraction. They found that this further fraction had a composition different from that of a fraction peptized by the citrate solution and point out that the supplementary fraction should be regarded as an artifact.

In the case of lateritic soils the authors found their method to be at fault in that in this case they observed a prolonged, gradual disintegration before obtaining complete dispersion. For the dispersion of such soils they prefer a sodium hydroxide solution, 1 g per liter, heating the soil with this solution for 1 hr. on a water bath.

They discuss also the composition of the extracted clay colloids.

The determination by optical means of the gels and gel mixtures which appear in the course of the process of weathering [trans. title], J. H. HELLMERS (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 80–82*).—The author points out that in the usual petrographic study of the soil the more or less weathered individual minerals are examined, whereas little attention is given to the newly formed gels and gel mixtures. By reason of the great importance of these gels for the characterization of a soil, omission of their consideration deprives the microscopic study of a soil of half its possible value. Since a knowledge of the refractive indices of the pure gels is prerequisite for their identification in soils, the author has examined silica and clay gels at various percentages of moisture content and very briefly reports upon such measurements. He also calls attention to the modifying influence of other soil components, and especially to the difficulties introduced by adsorbed iron hydroxide and human colloids. The refractive indices of silica and clay gels were found to rise with the increasing intensity of coloration by these adsorbed substances, but a satisfactory determination of the character of the gel under examination could be made when they were only lightly colored.

A study of the adsorption complex of mineral soils, D. J. HISSINK, J. VAN DER SPEK, and S. B. HOOGHOUDT (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 82–84*).—The study here discussed was carried out upon four fractions having particles 2μ or less in diameter, from 2μ to 8μ, from 8μ to 16μ, and from 16μ to 43μ. These fractions were freed from bases by electrodialysis, in which connection it is noted that "to prevent decomposition of the aluminosilicate complex it is absolutely necessary that the suspension to be dialyzed should not contain any humic matter." The values of x and y in the molecular ratio Al_2O_3, x SiO_2, y H_2O, the total adsorptive capacity for bases as indicated by the baryta method, and some other data are presented and discussed.

The identification of the clay substance of soils by means of roentgen ray investigations [trans. title], A. JACOB, U. HOFMANN, and H. LOOFMANN (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 85–88*).—The authors discuss briefly the significance of X-ray spectrographic investigations on bentonites and ceramic clays which indicate that the sorptive complex of soils consists of crystalline substances including kaolinite, montmorillonite, and halloysite.

Some properties of clay fractions, C. E. MARSHALL (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 88–90*).—The author stresses the fundamental importance, in an attempt to formulate a theory of soil formation, of the question "what is clay?" Until this basic question "has been satisfac-

torily answered it seems, to put it mildly, extremely rash to propound complex theories of soil formation processes." The possibility of obtaining fractions of 50-mμ particle size is mentioned in a brief indication of the methods used for the mechanical analysis of the clays studied. The present paper summarizes a study of the mineralogical character and chemical composition of clay fractions having particle sizes ranging from 2μ down to less than 100 mμ.

"One fact of general importance has emerged. Even in the most homogeneous clay (a bentonite) the proportionate increase in exchange capacity is much less than the proportional increase in the outer surface of the particles. This lends additional support to the view, already widely held, that a large proportion of the exchangeable cations are held inside the clay lattice. The evidence of the double refraction experiments is that the cations have definite places in this lattice."

Cataphoresis in soil science, A. Reifenberg (*3. Internatl. Cong. Soil. Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 38–40*).—Testing his technic with kaolin, the author obtained the greatest charge and cataphoretic movement of the material by dispersion in 0.002 N sodium hydroxide. He was able to effect a quantitative determination of soil colloids by this means. He reports also a "cataphoretic determination of fertilizer requirements", noting, in part, that "the greatest difficulty in chemical examination for the availability of nutrients in soils consists in separating the nutrients available for plant life from the sum total of potash and phosphates present. In free solution or adsorbed to colloids such salts are easily available to plants.

"During cataphoresis phosphates in free solution or adsorbed to colloids move to the anode. The same is true with potash adsorbed to colloids, whereas in free solution it moves to the cathode. (Part of the potash may also move to the cathode, since some electrolysis takes place.) We therefore succeed by cataphoresis in separating the potash and phosphates available for plants. For this purpose potash present in both tubes and phosphate in the anode tube has to be determined." Satisfactory agreement with the Neubauer (E. S. R., 53, p. 319) indications of plant food availabilities were obtained, but "it should be emphasized, however, that much more experimental data should be collected to test the value of the cataphoresis method for the determination of available nutrients."

On the formation of structure in soil.—I, The structure of soil colloids, D. I. Sideri (*Soil Sci., 42 (1936), No. 5, pp. 381–393, pl. 1*).—"The existence of aggregate phases in soil colloids alters essentially our conceptions regarding their behavior. The electric properties of colloid particles, when they agglomerate into groups, are radically changed as a result of the shrinking of the ion envelope. The properties determined by the nature of the absorbed cations are leveled out in the associated groups. The possibility of spontaneous coagulation, explained by the prevalence of the forces of molecular attraction over those of electrostatic repulsion, is demonstrated."

The affinity of the soil colloids for cations and anions, J. N. Mukherjee (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 90–92*).—"It appears that in discussing the properties of colloidal acids and bases, such as occur in soil, it is necessary to distinguish between their sol and gel conditions and the state of aggregation of the primary particles. Colloidal acids present special features which require that they should be treated on a basis different from acids in true solution. The total acid taking part in the interaction with an alkali above pH 7 is often a variable quantity as the particles dissolve. Besides, the intensity of the adsorption of cation is a factor which also determines the amount of acid taking part in the reaction. It appears

from measurements of specific conductivities and of the free acidity and also from the nature of the titration curves that they behave simultaneously as a weak and as a strong acid. . . . The process of liberation of acid or alkali by the interaction of a neutral salt with gels requires to be distinguished from that of sols. In the case of sols useful information regarding the affinity relationships has been obtained by titration with different alkalies, neutral salts of strong and weak acids, and strong and weak acids. Measurements of the number of particles per unit volume appear to be necessary. Simultaneous cataphoretic measurements are also helpful in this connection. The adsorbability of different ions determined from such measurements offer a quantitative measure of the affinity constants. The titration curves with strong acids and alkalies give an idea of the stability of the constituent alumina and silica in the clay complex. Information as to the free amounts of alumina and silica can also be obtained." Other factors affecting the behavior of colloidal acids and bases and methods for their investigation are outlined.

Flotation applied to the study of soil colloids, N. K. Krupsky (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 46–48*).—The author prepared humus sols by saturating Chernozem, "alkali" soil, and degraded Chernozem with the ammonium ion, and clay suspensions from the alluvial horizon of a dark-gray forest loam and from a kaolin. Studying the behavior of such preparations when brought into contact with various polar and nonpolar liquids, he found, in part, that:

"The behavior of different fractions of soil colloids on the dividing surface separating two liquids, of which one is more polar than the other, is not the same. Under corresponding conditions organic colloids are easily wetted by less polar liquids, when leaving a hydrous medium. Mineral colloids are more easily wetted by more polar liquids (in this case with water) and always remain in hydrous phase.

"At or near the neutral reaction the particles of humus soil are not wetted by faintly polar liquids. During the process of acidification humus rapidly becomes hydrophobic, and below the limit of coagulation the humus entirely passes into nonhydrous phase. During the process of acidification the double electrical layer is progressively destroyed, which facilitates the wetting of the surface of humus particle by faintly polar liquids. Wetting with nonpolar liquids and the removal of humus from the hydrous medium may also be brought about in neutral or alkaline conditions. To do this a third liquid must be added to a system of hydrous and nonhydrous phases, this third liquid mixing in any proportions with either liquid composing the system (such as ethyl alcohol, acetone, etc.). By replacing water in hydrated film of micelle, this liquid facilitates the wetting of the surface of a humus particle with faintly polar liquid. Highly alkaline humus also partly passes into the nonhydrous phase, even without applying an auxiliary dehydrator. Hence it is obvious that humus is a typical hydrophobic colloid. Most of the surface of the humus particle must be of carbonlike properties."

Numerous further observations of a similar nature are also recorded.

The adsorption of liquids by clays, E. W. Russell (*3. Internatl. Cong. Soil. Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 48–50*).—A contribution from the Rothamsted Experimental Station presents an analysis of the factors on which the apparent specific volume (or density) of a clay in different liquids depends.

"The results of this analysis are in accord with the hypothesis that clays adsorb nonpolar liquids only weakly, if at all, but that the adsorption of polar liquids is due to the orientation of the electric dipoles in their molecules in the

electrostatic fields around the exchangeable ions held by the clay and around the negative charges on the clay substrate."

The sorption of gases upon soil constituents and soils [trans. title], H. WIESSMANN and W. NEUMANN (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 51–53*).—The authors call attention to the fact that, although the sorption of ions from the aqueous phases in soils has been under careful investigation for years, the sorption of gases has been given scant notice. The soil constituents, the sorptive behavior of which was studied in the experiments here reported, included silicic acid, clay, iron oxide, and the carbonate and sulfate of calcium. The gases of which the sorption was measured were nitrogen and oxygen separately considered, air, carbon dioxide, and ammonia.

When the soil constituents named were used in their crystalline condition neither nitrogen nor oxygen showed any detectable sorption, even when the solids were reduced to a particle diameter of about 0.02 mm. When colloidal preparations of the sorbents were used, a vigorous sorption of nitrogen, oxygen, and air took place. The data indicated a behavior in accordance with Henry's law. The absolute magnitude of the sorption reached values of the order of 3×10^{-3} mols per 100 g of sorbent at an equilibrium pressure of 1 atmosphere.

The water content of the sorbents markedly affected the results, the extent of the sorption increasing sharply with the progressive dehydration of the sorbent.

The sorption of carbon dioxide and of ammonia ranged from 20 to 400 times that of the nitrogen and oxygen, indicating that "chemosorption" played an important part in the process insofar as these two gases were concerned.

Surface pressure, sorption, and resistance to wetting [trans. title], F. ZUNKER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 53–58*).—The author points out the important influence of surface pressure upon soils and plants and discusses theoretical considerations from which this value may be calculated, arriving at the expressions $P=K\left(1-\frac{r}{R}\right)$ for bodies of convex curvature and $P=K\left(1+\frac{r}{R}\right)$ for concave curvatures, R being the radius of curvature in either case, K the internal pressure, and r the molecular distance of the surface molecules, while the value of K is derived from the surface tension, alpha, by means of the relation $K=\frac{2\alpha}{r}$. He also finds that the surface pressure at the plane surface of a solid may be determined from the marginal angle formed by a drop of a liquid of known internal pressure when such a drop is brought into contact with the surface. The relation found to hold good in this case is $K_x=\frac{2\,K_1}{1+\left(\frac{1}{\sin\Psi}-\frac{1}{\tan\Psi}\right)}$.

The author further discusses the relation of surface pressure to adsorption and to the resistance to wetting. He defines resistance to wetting in terms of surface pressure by stating that if the surface pressure of a solid, such as the soil particle, is less than that of the liquid which comes into contact with it, there is a noncapillary relationship between solid and liquid, or a resistance of the solid to wetting by that liquid.

On the conformity of base-exchange phenomena to physicochemical laws [trans. title], F. ALTEN and B. KURMIES (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 59–62*).—From the experimental data and results of theoretical calculations here discussed the authors conclude that the observed facts are in general in good agreement with electrochemical theory. A number of base-exchange experiments are briefly summarized, some of them leading to the conclusion that aluminum is bound in the sorption complex in the

ionogenic state and is capable of direct exchange with the cations of neutral salts.

Soil : water ratios in base exchange, H. GREENE (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 63–65, fig. 1*).—The author shows that changes in the soil : water ratio are responsible for discrepancies which have been noted in the results obtained in the use of an equation intended to represent the course of the base-exchange reaction. He adds that "strictly speaking it is the colloid : water ratio rather than the soil : water ratio that should be held constant." He further points out that "as a minor modification of technic it is advisable to use widely different amounts of ammonium chloride as displacing agent, say 100 and 800 m[illigram] eq[uivalents] per 100 g soil."

The pH and base saturation of the Podzol profile, S. MATTSON (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 67–70*).—The author determined the pH of a number of Podzols on sand and sandy moraine in their natural state and after the soils had been rendered completely unsaturated by electrodialysis. "The results bring out the remarkable fact that the actual pH is in general lower than the ultimate pH in the C and B horizons of the Podzol profile." He further calls attention to the fact that "it is generally assumed that the soil in the lower Podzol horizons is more saturated with bases than the soil in the upper horizons. This has been a quite natural conclusion when based on the difference in pH, but we see now that the facts are what appears to be a paradox—the most acidic upper horizons are also the most saturated with bases . . . The theory of isoelectric weathering . . . not only accounts for the facts here presented but also leads us to the conclusion that it could not be otherwise." The remainder of this brief note amplifies and illustrates the last statement.

The hydrolysis of calcium carbonate and its relation to the alkalinity of calcareous soils, T. F. BUEHRER and J. A. WILLIAMS (*Arizona Sta. Tech. Bul. 64 (1936), pp. 41, figs. 13*).—The authors have investigated the behavior of calcium carbonate in soils and the forms in which it occurs.

In calcareous soils, calcium carbonate "probably exists . . . in one or more of the following forms: (1) Calcite; (2) aragonite; (3) basic calcium carbonate: $CaCO_3.Ca(OH)_2.xH_2O$; (4) a double sodium-calcium carbonate: $CaCO_3.Na_2CO_3$; (5) a highly hydrated, amorphous form resulting from recent precipitation on or between soil particles; (6) $CaCO_3$ particles coated with an adsorbed film of a protective organic or inorganic colloid."

Various factors were found to influence the extent of the hydrolysis of calcium carbonate in soils and its effect upon soil reaction. "The effect of neutral salts was to reduce the hydrolysis of calcium carbonate, the order in which the chlorides of calcium, magnesium, potassium, and sodium affected it being approximately that of the lyotropic series. Organic and inorganic colloidal materials are found to decrease the hydrolysis of calcium carbonate markedly. This effect is attributed to the adsorption of a film of the colloidal material, which inhibits the further hydrolysis of the calcium carbonate particles. The soil itself may also adsorb some of the free hydroxyl ions which are present in solution as a result of the hydrolysis. It is suggested that this may account for the fact that some soils containing considerable calcium carbonate may not be appreciably alkaline and even neutral.

"When calcium carbonate is added to alkaline soils, there is no appreciable effect on the pH. In the case of acid soils the effect closely approximates an ordinary electrometric buffer curve for the soil, with a very pronounced increase in pH upon additions up to 10 percent by weight of calcium carbonate, beyond which the pH slowly rises to that of pure calcium carbonate. Buffer titration

curves for calcium carbonate, sodium and calcium bentonites, and for four alkaline calcareous soils were obtained. It was found that the calcium carbonate gives only one inflection point corresponding to the total neutralization of the sample taken. The pH remains constant over an extended series of additions of acid, indicating high buffer capacity. The sodium and calcium bentonites, on the other hand, showed relatively slight buffer action. A correlation of these results with similar curves for soils leads to the conclusion that the buffer capacity of these soils is due in large measure to the calcium carbonate present. This is also substantiated by the fact that the specific buffer capacity of calcareous soils is found to be approximately a linear function of the percentage of calcium carbonate present. Calculations from the ionization constants for carbonic acid, made on the basis of three different assumptions, showed that the first ionization constant reproduces the observed pH values for the buffer titration of calcium carbonate most closely. It is concluded that this equilibrium is the predominant one in determining the pH of calcium carbonate and of soils."

The influence of certain replaceable bases in the soil upon the elemental composition of vegetable crops, J. B. HESTER and F. A. SHELTON (*Soil Sci., 42 (1936), No. 5, pp. 335–340*).—On the basis of analyses made at the Virginia Truck Experiment Station, the authors state that "the presence of a large amount of a particular replaceable base in the soil colloidal complex influenced the elemental composition of plant material even though the yields were affected but little. A high replaceable calcium content suppressed the adsorption of potassium, nitrogen, and magnesium; a high replaceable magnesium content suppressed the absorption of potassium, calcium, and nitrogen; and a high potassium content suppressed the absorption of calcium, magnesium, and nitrogen."

Soil reaction and total acidity, F. E. HANCE and L. E. DAVIS (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 4, pp. 319–327*).—The authors describe this popular article as "a discussion of soil pH, base exchange, and kindred topics—terms of everyday usage."

Soil microbiology, C. THOM (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1936, pp. 15, 16*).—A note is given on the favorable effect of controlled temperature of fermentation upon the formation of composts suitable for mushroom culture and a very brief summary of observations on the bactericidal activities of the ameboid form of the myxomycete *Dictyostelium discoideum* which was found capable of destroying various micro-organisms pathogenic to plants, animals, and man.

The biological and chemical oxidation of ammonia to nitric acid, A. S. CORBET (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1936, Trans., vol. 1, pp. 133, 134*).—The photonitrification of ammonium salts in sterile soils, reported upon by Rao and Dhar (E. S. R., 65, p. 418) and by Dhar et al. (E. S. R., 70, p. 16) [but not detected by Fraps and Sterges (E. S. R., 73, p. 19)], has been "confirmed in a large measure" by the present author's work at Jealott's Hill, England. It has been further established "that nitrite formation can occur in soil exposed to ultraviolet light in the absence of added ammonium salts or photosensitizers." The author further finds that the mechanism of nitrification may be either biological or chemical. It also appeared that under certain conditions the oxidation may proceed through the stages of hydroxylamine and hyponitrous acid, and that, "while the first-named can never have more than an ephemeral existence under the experimental conditions, hyponitrous acid present in the form of the calcium salt may account for as much as 40 percent of the total nitrogen present."

Of the nitrification processes in general, it is the author's opinion that "in soils in temperate regions it seems that the first stage in nitrification is effected by *Nitrosomonas*, or allied organisms, although photonitrification at the surface during the summer months is not precluded. Judging by the results obtained at Jealott's Hill, it appears that *Nitrobacter* is much rarer than the nitrite-forming bacteria, and the oxidation of nitrite in the soil may be largely a consequence of the acid reaction of the medium.

"The extent to which nitrification takes place by a photochemical process in tropical soils remains to be assessed, but in cleared areas in the humid Tropics with a shallow topsoil layer probably photonitrification is an important process. The continual wetting and drying-out which daily takes place in exposed soils in the equatorial belt must be responsible for some nitrite formation. The acid nature of the soils of the humid Tropics effectually insures that there is no nitrite accumulation, and it may well be that here nitrate formation is entirely a chemical process."

Chemical nitrification in soil, G. DE' ROSSI (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 135–137*).—Referring to the observations of Rao and Dhar (E. S. R., 65, p. 418) with respect to photochemical nitrification, the author finds that heat, rather than light, is the important factor in nonbiological nitrification. He states, in part, that "my work shows that, under perfectly normal conditions, ammonia naturally existent in the soil undergoes a process of oxidation until nitric acid is produced, and this quite independently of any microbiological activities, quite apart from any influence exercised by light. This process, however, is particularly favored by a moderate degree of heat, such as may be experienced in any land through the agency of the sun's rays in the spring, summer, and autumn." He also describes briefly a technic by means of which "a demonstration of this assertion [above quoted] is very simple."

On the number and variety of nitrifying organisms, H. WINOGRADSKY (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 138–140*).—Noting that a systematic study of the nitrifying microflora has not been made and that a suitable technic has not hitherto been described, the author calls attention to the fact that such a study "has become relatively easy by employing the method of silica-jelly plates, coated with carbonates or kaolin, which has been recently worked out at the laboratory of the Institut Pasteur at Brie-Comte-Robert, [France]." By such means several new genera and species were isolated and characterized and are here briefly described. It is noted that some of the new forms "are very curious from the point of view of bacterial morphology."

A growth and respiration factor for certain rhizobia, S. R. HOOVER and F. E. ALLISON (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935. Trans., vol. 1, pp. 158–160*).—This note, which is a contribution from the U. S. D. A. Bureau of Chemistry and Soils, outlines some of the authors' observations of the nature and effects of a growth-stimulating factor by the presence of which in small quantities the growth of *Rhizobium trifolii* in synthetic media "is commonly increased 20 to 30 times." The authors designated this substance as "coenzyme-R." They state, in part, that "coenzyme-R occurs not only in legume plants but in practically all natural materials examined. Cane molasses, yeast, soil humate, crude egg albumin, and liver are excellent sources of the material. Its synthesis by the free-living nitrogen fixer *Azotobacter*, which itself has a very high rate of respiration, is especially noteworthy."

On the decomposition of pentosans by soil and dung micro-organisms, J. ZIEMIĘCKA (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1,*

pp. 167, 168).—"Pentosan decomposition in nature is due to the action of a specific microflora, which may be composed either of bacteria (rods) or of different kinds of molds (mostly Mucedineae) or of both groups of microorganisms. The process can be accompanied by nitrogen loss and therefore be harmful for the general balance of mineral nitrogen in soils and in manures."

Antagonistic action of soil microbes with special reference to plant hygiene, I. Hino (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 173, 174*).—The author outlines the results of experiments which he believes to "show the important role of soil microbes in destroying the plant pathogens in the soil, and therefore the possibility of applying the principle in practice in plant hygiene is hopeful. Before making practical applications, however, climatic conditions, water contents, reaction, and other soil properties must be carefully considered, and the microbes which are not antagonistic, or least antagonistic, to the useful soil inhabitants are to be preferred. The protozoa are no doubt very strong in antagonistic action to plant pathogens, though these organisms are not suitable, as their abundant existence and strong activity often induce soil sickness. Soil bacteria and soil fungi are more suitable for the purpose."

Short-period fluctuations in bacterial numbers in soil, H. G. Thornton and C. B. Taylor (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 175–179, figs. 2*).—The authors discuss the shortcomings of the plate count and the direct microscopic methods for determining bacterial numbers in soils and propose a procedure based, in part, upon that of Conn (E. S. R., 60, p. 20).

"A suspension of indigo particles is made up, and the number of particles per milliliter is determined by a hemocytometer count. A known mass of soil is shaken in a known volume of this counted suspension. Films of the resulting mixture are prepared, dried, and stained with erythrosin. Counts are made of the bacterial cells and of the indigo particles, in random microscope fields, and the numerical ratio of indigo to bacteria is calculated.

"Since the absolute number of indigo particles added per gram of soil is known, the number of bacterial cells is easily calculable. The calculation of bacterial numbers is, of course, independent of the quantity of soil examined. Moreover, because the disturbing influences of drying act alike on the bacteria and on the indigo, the ratios found in replicate microscope fields have a random distribution."

Tests and checks of this method indicated that it "has an accuracy as good as that of the plate method, and, in addition, it gives an estimate of the absolute numbers of stainable bacterial cells. Among its limitations are the facts that it does not indicate whether the stainable cells counted are alive, and that the organisms can be identified only by their cell shapes and size."

This method was applied in the study of short-period fluctuations of bacterial numbers, the counts having been made at 2-hr. intervals.

The reduction of nitrate by individual strains of free-living bacteria, J. Meiklejohn (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 180–183*).—"Eighty free-living strains of bacteria were tested as to their ability to reduce nitrate in synthetic media. Five types of reaction with regard to nitrate were observed: (1) No reduction of nitrate, (2) reduction of part of the nitrate to nitrite, (3) quantitative reduction to nitrite, (4) reduction to nitrite followed by reduction to ammonia, (5) reduction to nitrite followed by evolution of nitrogen gas."

The effect of different media on soil protozoan counts, A. Dixon (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 179, 180*).—The

author compared two media, "using peptone agar and soil-extract agar for protozoan counts from 55 Russian tobacco soils. The dilution counts were made on each soil sample using peptone agar and soil-extract agar obtained from each individual soil. A more varied protozoan population developed on the soil-extract agar, which gave much higher protozoan numbers than did the peptone agar." Other illustrative observations are mentioned, and the author reaches the conclusion "that the growth of protozoa on soil-extract agar gives a truer picture of the soil protozoan fauna than would be obtained from peptone agar, if used as a medium."

Some observations on the Aspergillus niger method, A. M. SMITH (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 171–173*).—Dealing with some details of technic, the author has found, in part, that "(1) considerable latitude is permissible in the concentration of inoculum employed without sacrifice of accuracy, (2) ammonium nitrate or sulfate seems to be the best source of nitrogren, (3) the area of growth of the mycelium, i. e., size of vessel, is very important, (4) strain may exert a specific effect upon the results, and there may be an interaction between soil and strain, i. e., different strains may not put a series of soils in the same order of fertility, (5) the development of the fungus is not influenced to a serious extent by the application of lime to the soil in quantities normally used to correct soil acidity, (6) the standard error of experiment is of the order 4 or 5 percent for an individual determination."

The role of the bacteriophage in the "fatigue" of soils cropped to lucerne [trans. title], A. DEMOLON and A. DUNEZ (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 156, 157*).—The authors refer to the gradual loss of the vigor of the leguminous crop, accompanied by gradually increasing weed competition. Experiments here very briefly summarized led him to the conclusion that this failure is due to a bacteriophage specific for *Bacillus radicicola*. Reinoculation restored the normal growth of the legume crop.

Electrodialysis as a means of measuring fertility, J. V. CUTLER and I. DE V. MALHERBE (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 95–97*).—The authors report experiments with about 60 soils, samples of from 10 to 35 g having been electrodialyzed at an electromotive force of 150 v and a current of 0.2 a. Best agreement with the results of field trials and laboratory tests was obtained by measurements of the rate of outgo of the nutrient ions during the first stages of the electrodialysis. The authors also determined the total of nutrient ions removed during a complete electrodialysis, but state that "we feel that the rate of outgo is far more valuable as a criterion than the total removed in the case of K, Ca, P_2O_5, and the aggregate.

"Nitrate nitrogen determination was not as accurate as that of the other ions, the . . . removal of interfering bodies being at times very difficult . . . We found the method suitable within limits, and the figures give a clue to the content of the soil.

"By suitable adjustment of the conditions and period of electrodialysis it is possible to obtain removal equal to displacement by various strengths and bulks of displacing agents. This is of very considerable significance and opens up further lines of investigation."

Commercial fertilizers report for 1936, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 390 (1936), pp. 59+IX*).—In connection with this presentation of the 1936 commercial fertilizer inspection analyses, organic materials as soil amendments are very briefly discussed. Analyses of some special and home mixtures and of manures and liming materials are also reported upon.

Commercial fertilizers, 1936, E. R. Tobey (*Maine Sta. Off. Insp. 161 (1936), pp. 71–118*).—This report contains the analytical data obtained in the 1936 official analyses, including determinations of the magnesium content.

Commercial fertilizers in 1935–36, G. S. Fraps, S. E. Asbury, and T. L. Ogier (*Texas Sta. Bul. 529 (1936), pp. 51*).—This bulletin presents, for the 1935–36 season, the usual annual analyses, together with information on the local use of fertilizers and recommendations for various crops.

AGRICULTURAL BOTANY

Life and work of Cyrus Guernsey Pringle, H. B. Davis (*Burlington: Univ. Vt., 1936, pp. [3]+756, [pls. 2, figs. 2]*).—This volume includes accounts of Pringle's early plant-breeding work and of his plant collecting in Vermont, the western United States, and finally in Mexico (E. S. R., 25, p. 195). Information is included about Mexican plants and ecological data on the flora of Central America and Mexico gleaned from his diaries, correspondence, published papers, etc. The distribution lists of Mexican plants are from three herbariums (National, Gray, and Pringle).

Groups of plants valuable for wildlife utilization and erosion control, W. L. McAtee (*U. S. Dept. Agr. Circ. 412 (1936), pp. 12, pls. 7*).—The author discusses and lists plants utilized by wildlife (cover plants, browse plants, herbage, mast producers, fruit producers, and seed producers) and those useful to wildlife that have been recommended also for erosion control, including crop and pasture plants and vines, shrubs, and trees.

Tree ring width as an index of physiological dryness in New England, C. J. Lyon (*Ecology, 17 (1936), No. 3, pp. 457–478, figs. 5*).—"The annual rings of old hemlock trees (average age 270 yr.) have been carefully measured and graphs made from the mean values in order to show the fluctuations in radial growth rates from year to year. Cross-identification of individual trees within a forest and of groups of trees from several sites in Vermont and New Hampshire is entirely possible, due to dominance of the factor of physiological dryness within the area. Many years since 1600 are found to have been outstanding for the good moisture conditions available for plant growth. During the same three and a third centuries about twice as many years are marked by actual physiological drought which retarded plant growth throughout the entire area. Cyclic effects are not evident. In general, the standard weather records of an area fail to indicate the years with particularly favorable or unfavorable conditions for growth, while the hemlock tree, as used in this analysis, offers a better as well as much longer record of these conditions in its general locality."

The accuracy of growth substance determination methods [trans. title], I. Juel (*Planta, Arch. Wiss. Bot., 25 (1936), No. 2, pp. 307–310*).—The action of a standard solution of β-indolyl-acetic acid on oat coleoptiles was tested by means of the growth substance determination method used in Köbenhavn (Copenhagen), the fluctuations in size of curvature from day to day in two experimental series amounting to only about 35 percent.

Growth hormones in plants, P. Boysen Jensen, trans. and rev. by G. S. Avery, Jr., and P. R. Burkholder (*New York and London: McGraw-Hill Book Co., 1936, pp. XIV+268, figs. 64*).—This English translation (with the collaboration of H. B. Creighton and B. A. Scheer) of the German work previously noted (E. S. R., 75, p. 185) has been "expanded to include 188 new contributions to the literature and 40 additional illustrations", and a summary at the end of each chapter and an index have been added. The arrangement of certain chapters has been modified to facilitate the familiarization of students with technics and general methods of procedure, and the essential features of the "controver-

sial final chapter of the German edition have been included so far as possible in earlier chapters. . . . A selected list of titles dealing with the influence on plants of substances such as bios, folliculin, and other sex hormones, those affecting the growth of fungi, etc., has been added for the convenience of students interested in these topics. They are not discussed in the text."

Studies of growth-promoting substances [trans. title], H. DOLLFUS (*Planta, Arch. Wiss. Bot., 25 (1936), No. 1, pp. 1–21, figs. 8*).—This is a thesis from the University of Rostock in which, using the diffusion procedure and the oat test, the author claims to have demonstrated for *Sorghum vulgare* that the upper 2 mm of the coleoptile are rich in growth hormone, the next 2 mm much less so, and that the remaining 4 mm, like the nodes and epicotyl, contain none. Decapitated maize seedlings with a rich supply of growth hormone show a gradual decrease in geotropic sensitivity in the coleoptile. When the decapitation is done up to or beyond the nodes, the presentation time is very much increased. Polarizability is still present but weak. In corresponding experiments with sorghum, the phototropic sensitivity of the first 2 mm drops rapidly, but with abundant growth hormone and light phototropic curvatures of the epicotyl stump can be obtained. It is thus polarizable by light. The growth hormone of pollinia causes root formation in epicotyl stumps. In leaves of *Podophyllum* the tip is the principal growth hormone center. The lamina, however, forms the hormone and conducts it basipetally in the vascular elements. In the onion seedlings the essential oil is toxic to growth, inhibiting the growth of coleoptiles. Here the growth hormone is conducted basipetally from the seedling tip. Ovaries and cupules of various plants are rich in growth hormone in the seed primordia. They furnish the growth hormones necessary for growth stretching in the pericarp or cupule.

Inducement of fruit development by growth-promoting chemicals, F. G. GUSTAFSON (*Natl. Acad. Sci. Proc., 22 (1936), No. 11, pp. 628–636, figs. 5*).—Indole-3*n*-propionic acid, indolebutyric acid, indoleacetic acid (heteroauxin), and phenylacetic acid in lanolin were applied to the stigma or to the cut style in flowers nearly ready to open. Tomato, snapdragon, salpiglossis, petunia, tobacco, *Agapanthus*, *Vallota*, *Zephyranthes*, begonia, Hubbard squash, crooknecked squash, cucumber, watermelon, eggplant, and pepper were used. All the chemicals stimulated enlargement of the ovaries beyond that met with in unpollinated and untreated flowers, and mature fruits, without seeds, were produced in tomato, petunia, salpiglossis, and pepper.

The action of materials of oestrogenic nature on plant growth [trans. title], K. NEHRING and H. MÖBIUS (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 44 (1936), No. 1–3, pp. 95–140, figs. 2*).—A series of experiments were conducted to determine whether stable manure and liquid manure contain materials of oestrogenic nature which exhibit a specific action on plant growth, and whether in a certain measure the favorable effects of these manures may not be attributed to them. The results appeared to indicate only a general stimulatory action of the follicular hormones present. The view that these substances possess a special significance for the action of these manures is excluded, since in the tests described they were present in too small quantities for any such role.

Preliminary observations on growth and phototropic response of oat seedlings, E. KARRER (*Smithsn. Misc. Collect., 95 (1936), No. 9, pp. 4, fig. 1*).—It is concluded from this preliminary study that the conditions for optimum growth and greater uniformity of phototropic response involve contact with nutrient solution, radiant energy of extended wavelengths (at least different wavelengths at different growth stages), a wave of temperature rather than constant temperature, perhaps darkness as well as light, and proper atmosphere.

Growth of germ tubes of Erysiphe spores in deuterium oxide, R. Pratt (*Amer. Jour. Bot., 23 (1936), No. 6, pp. 422–431, figs. 5*).—In concentrations of D_2O of from 0.02 to 100 percent spore germination proceeded readily. Subsequent elongation was markedly inhibited by higher concentrations, which appeared to limit the amounts of solutes and colloids within the spores available for growth.

Stimulation of root-hair growth in legumes by sterile secretions of nodule bacteria, H. G. Thornton and H. Nicol (*Nature [London], 137 (1936), No. 3464, pp. 494, 495*).—This note reports quantitative evidence of such stimulation in a study of the action of bacterial secretions on root-hair growth. Further data are needed before the active component of the secretions can be definitely related to other growth-stimulating substances, and before it can be determined whether the same substance also stimulates growth of cells within the root.

The influence of individual mineral elements of the nutrient medium on the formation of acids by the fungus Aspergillus niger, II, V. S. Butkevich (Butkevitsch) and A. G. Timofeeva (*Mikrobiologiia, 4 (1935), No. 4, pp. 489–494; Eng. abs., p. 494*).—In *A. niger* cultures with a relative nitrogen deficit, potassium and sodium nitrates proved a more efficient source of nitrogen for citric acid accumulation than did ammonium nitrate. Elimination of iron from the medium had no noticeable effect on the acid formation, but withholding zinc caused a considerable decrease in citric acid and a rise in gluconic acid. Limiting of the fungus development by a relative deficiency of phosphorus and sulfur but with abundant nitrogen gave an intensive citric acid accumulation, but the latter result did not occur when growth was limited by a potassium and magnesium deficit. A certain relative excess of these elements was a necessary condition for the formation and accumulation of acid.

Occurrence and transport of a substance causing flowering in the soya bean (Glycine max L.), J. Kuijper and L. K. Wiersum (*K. Akad. Wetensch. Amsterdam, Proc., 39 (1936), No. 9, pp. 1114–1122, figs. 3*).—The results are given of experiments which convince the authors that a material carrier of some sort was transported over the graft union from flowering, short-day scions to long-day vegetative stocks and accelerated flowering in the latter.

A growth-substance inactivator from Phaseolus seedlings [trans. title], P. Larsen (*Planta, Arch. Wiss. Bot., 25 (1936), No. 2, pp. 311–314*).—A growth substance inactivator (probably destructive in its action) was isolated from wounded *Phaseolus* seedlings with agar and was found also in the press sap of nonwounded seedlings. It was at least partially thermolabile.

Physiological studies on Rhizobium, VI, VII, D. W. Thorne and R. H. Walker (*Soil Sci., 42 (1936), Nos. 3, pp. 231–240, fig. 1; 4, pp. 301–310, figs. 2*).—In continuation of this series of studies (E. S. R., 76, p. 312) at the Iowa Experiment Station, the following two papers are presented:

VI. *Accessory factors*.—Small amounts of iron added to a nitrate-sucrose C. P. medium greatly increased the growth of *R. trifolii* and *R. meliloti*, the optimum concentration being about 10 p. p. m. Several *Rhizobium* species failed to maintain continuous growth in a mineral salts-sucrose C. P. medium with KNO_3 as nitrogen source but were able to do so with NH_4Cl or asparagine. Reducing agents (e. g., cysteine or thioglycolic acid) increased the growth and oxygen utilization in media composed of highly purified materials. There was no evidence that these bacteria require any complex, unidentified substance for growth, but many materials stimulated their growth and respiration in the media above noted.

VII. *Some physiological effects of accessory growth factors*.—Measuring oxygen consumption and CO_2 production in Warburg manometers, the following physiological effects were noted. Brown cane sugar, soil extract, *Azoto-*

bacter vinelandii medium extract, and cysteine added to KNO_3 or NH_4Cl media lowered the respiratory quotient of *R. trifolii* for the first few hours, and yeast and alfalfa extracts did so for most of the active-growth period. Agar lowered the respiratory quotient of *R. meliloti* in a glucose-nitrate but not in a glucose-yeast extract medium.

Indications were obtained that the accessory substances studied reduce the oxidation-reduction potential of KNO_3–sucrose C. P. media. An important role of these substances appears to be that of an initial hydrogen donator. Its role in turn appears to be to lower the oxidation-reduction potential of the medium and to furnish a readily available initial source of energy, enabling the bacteria to make the necessary adjustments for establishment of favorable growth conditions.

Studies of nitrogen translocation in the higher plants [trans. title], H. FISCHER (*Ztschr. Bot., 30 (1936), No. 10, pp. 449–488*).—The author presents an analytical and experimental review, including the significance of turgor in translocation, the independent translocation of nitrogen and carbohydrates, escape from cut-off leaves, and the effects of narcosis and oxygen deficiency. A bibliography of 70 titles is provided.

The role of potassium and phosphorus in the assimilation of various forms of nitrogen by plants [trans. title], T. W. TURTSCHIN (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 44 (1936), No. 1–3, pp. 65–83*).—The action of potassium and phosphorus on nitrogen assimilation by plants is said to be connected with their influence on the course of the oxidation-reduction processes. Phosphorus furthers the reduction activity of the plant and thus influences the intake of nitrates. Potassium activates the oxidative processes and so exerts a positive influence on the primary synthesis of amides at the expense of ammoniacal nitrogen.

Phosphorus nutrition of citrus and the beneficial effect of aluminum, A. R. C. HAAS (*Soil Sci., 42 (1936), No. 3, pp. 187–201, pls. 2*).—In this study by the California Citrus Experiment Station the use of calcium aluminate proved beneficial to both the roots and tops of lemon seedlings. In aerated culture solutions the beneficial effect of phosphate on lemon leafy-twig cuttings was largely in the growth of the tops. With aluminum present the roots were healthy and more extensive, but the tops were usually retarded. Very little growth may occur in nonaerated cultures deficient in phosphorus, though the roots remain healthy. Aluminum greatly improved the root systems of Lisbon lemon leafy-twig cuttings grown without phosphate, but when phosphate was present for a few days at intervals of several weeks aluminum benefited the roots at the apparent expense of the tops. Root caps were numerous with aluminum in the culture solution. Lateral buds inhibited by phosphate deficiency resumed growth when it was added. Extreme symptoms of such deficiency were accompanied by a low phosphorus content of the tissues. Aluminum proved beneficial to the early growth of Valencia orange leafy-twig cuttings whether or not zinc was added to the culture solution. When aluminum containers were used for the cultures, the roots appeared healthy and were much shorter when 105 p. p. m. of phosphate were added continuously than when the phosphate was present for only a few days at intervals of several weeks.

Substitutes for potassium in metabolism of the lowest fungi, O. RAHN (*Jour. Bact., 32 (1936), No. 4, pp. 393–399*).—This is a contribution by Cornell University.

"*Aspergillus niger*, two species of *Saccharomyces*, various species of *Mycobacterium*, and all Gram-positive bacteria so far investigated require potassium

for growth. The only element capable of replacing K in yeast, mycobacteria, or aerobic sporeformers is rubidium, though the crops are smaller. The evidence regarding substitution by cesium is contradictory in *Aspergillus*, negative in the other organisms. Lithium or sodium cannot replace potassium, nor can the bivalent radioactive elements do this. Since rubidium is the only substitute, it seems that the radioactivity of potassium is an essential factor in its role, but not the only factor. The Gram-negative bacteria investigated so far, with the exception of *Rhizobium*, can grow without potassium. At least they develop to large numbers in media made from analyzed C. P. chemicals in glass containers, and addition of potassium salts does not greatly increase the crop. Gram-positive bacteria develop in such media only after addition of potassium salt."

Relation between the pH of the culture substrate and the action at a distance of lead [trans. title], C. SEMPIO (*Riv. Patol. Veg., 26 (1936), No. 7-8, pp. 279-297, figs. 11*).—Studies of the effects of lead, acting at a distance, on the development of *Thielavia* (*Thielaviopsis*) *basicola* are reported.

Cryptotrophic malnutrition of sorghum in solution culture, K. A. GROSSENBACHER and B. E. LIVINGSTON (*Amer. Jour. Bot., 23 (1936), No. 9, pp. 588-591, figs. 2*).—From the results of a 42-day series of solution cultures in the greenhouse, it appeared that of the 27 elements tested Mn, B, Zn, and Cu were all necessary for excellent growth of Black Amber sorghum under the general conditions. Apparent symptoms of malnutrition seemingly due to deficiency of Mn, B, Zn, and Cu are superficially described in terms of the appearance of the plants, dry weights of top and roots, and water content of top.

Toxicity of mercury vapor to germinating tobacco seeds, R. R. KINCAID (*Plant Physiol., 11 (1936), No. 3, pp. 654-656*).—This study at the North Florida Substation indicates that toxicity varies directly with the area of mercury exposed, and that the area to which germinating tobacco seeds could be exposed under the experimental conditions without apparent injury was less than 0.07 cm^2 in 4 l of enclosed space, or 0.018 cm^2 per liter. Preliminary tests supported the theory that the toxicity of mercury varies directly with the temperature. "These observations suggest that caution must be exercised in the use of mercury devices, such as pumps, manometers, and seals in biological apparatus."

The composition of the cell wall in plants, I [trans. title], R. S. HILPERT (*Ber. Deut. Chem. Gesell., 69 (1936), No. 6, pp. 1509-1514*).—Analyses are presented of the cell-wall material of the primary shoots of asparagus before emergence, of malted barley embryos, and of seedlings of oats, maize, wheat, and rye.

The physiology of tannin in the plant cell, II [trans. title], W. HAUSER (*Protoplasma, 26 (1936), No. 3, pp. 413-417*).—Continuing these studies (E. S. R., 75, p. 316), it is shown that in the system gelatin-water-alcohol tannin checks the separation into its component parts. Tannins, as phenols of large molecule, thus maintain the homogeneity of the plasma and they also exert a protective action against injurious influences, such as drying and frost.

The structure of the non-starch-containing beet chloroplast, E. WEIER (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 645-652, figs. 2*).—In this study at the Oregon State College, by the use of critical fixing, staining, and illuminating methods and comparing fresh material with specially prepared material, clear evidence was obtained that the chloroplast in starch-free cells of garden beet foliage consists of a colorless matrix in which small spherical granules are embedded. Observation in blue and red light indicated that the chlorophyll pigments were confined to these granules. In addition to chlorophyll, a Sudan

H-staining substance was found associated with the granules. A general review of present-day conceptions of chloroplast structure is included.

The state of water in ducts and tracheids, G. J. Peirce (*Plant Physiol., 11 (1936), No. 3, pp. 623–628*).—Carrying further his previous studies (E. S. R., 76, p. 168), the author discusses certain general phases of the problem as resulting from a consideration of his observations and experiments under climatic conditions of considerable variety, and then details the methods and records of the present study.

It is deemed clear from the evidence that in the mass of wet wood constituting a part of the vascular system of a living plant water may exist exclusively in liquid form, or part in liquid form and part as vapor. The liquid water may fill a duct or tracheid, it may be "bound" in the walls, it may be more or less free on the wall as a film, and it may fill as vapor the remainder of the space surrounded by the wet wall. "Transpiration from the surfaces, wherever they may be, of the continuous mass of water of which the living organism consists will set up, in the mass forces, tensions which will conform in place and power to the structure and composition of the system. The bound water of the walls of the vascular elements forms a water seal. . . . Hence the traction is upward, not lateral. . . . The maintenance of water as vapor, liquid film, and liquid mass in the vascular element and their walls, in the hydrostatic-pneumatic system of woody plants, is possible only when living cells are duly associated with the vascular tissues. . . . The living cells are indispensable, not for moving but for conditioning the movement of water."

Further notes on water and cane ripening, C. E. Hartt (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 4, pp. 355–381, figs. 6*).—Continuing these studies (E. S. R., 72, p. 308), using the variety H 109, the author found that although photosynthesis can take place in plants below the wilting point the process is more active with adequate water supply. Carbohydrate translocation was also more active under an adequate water supply, but storage was greater in plants deprived of water. The sugar in plants receiving water was more readily expressed than that in plants deprived of water.

After 48 hr. in darkness there was a decrease in the invertase activity in the leaf blades, but this enzyme was more responsive to changes in light or darkness under plentiful than under deficient water supply. Maltase in the blades was less sensitive to darkness than invertase. Withholding water resulted in an increase in invertase activity in the blades in darkness but a decrease in light, though its activity in the other plant organs seemed unaffected by the water supply. Withholding water induced a decrease in amylase and dextrinase activity in the blades. The plants having the most active invertase, amylase, and maltase in the blades had also the highest percentages of sucrose and polysaccharides in the blades. These enzymes of the leaf blades were sensitive to differences in moisture and light, but those in the sheaths were less so than those in the blades. The only enzyme in the green-leaf cane apparently affected by treatment was maltase, while in the dry-leaf cane any differences due to treatment were so small as to be considered insignificant.

The fluctuations of sugars in the leaf sheaths of the sugar cane plant during the day and the night, C. E. Hartt (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 4, pp. 329–354, figs. 6*).—This paper considers the nature of translocation in the sugarcane plant, the location and time of its occurrence, the external and internal factors affecting the rate, and theories as to the mechanism. The results of analyses of moisture, simple sugars, cane sugar, starch, and total polysaccharides in the sheaths at hourly

or bihourly intervals during both day and night are given in graphic and tabular forms.

Both cane sugar and the simple sugars were found to be translocated, and transport occurred both by day and by night. The percentage of water proved an important factor in determining which form of sugar was transported the more predominantly in a given plant at a given time. The temporary storage of polysaccharides in the sheath during the night aided in the translocation of carbohydrates from the blade into the stem.

The dependence of the respiratory intensity of organisms on the water content and colloidal state of the protoplasm [trans. title], C. SCHLIEPER (*Biol. Zentbl., 56 (1936), No. 1–2, pp. 87–94, figs. 2*).—This is a review of published works on the subject as pertaining to both plants and animals, including a literature list of 23 titles.

Comparative study on the mechanism of the respiratory process of two closely related strains of Rhizopus nigricans in connection with the differentiation of the thallome and the changes of external conditions, E. KANEL' (KANEL) (*Mikrobiologiiâ, 4 (1935), No. 4, pp. 636–654; Eng. abs., pp. 652–654*).—The study reported was carried out in two parts: (1) Preliminary tests for study of the oxidation-reduction conditions created during growth and of the energy expenditure by the fungus under the usual cultural conditions, and (2) parallel tests with ordinary cultures and with submerged ones not showing the differentiation into upper and lower thallus surfaces.

Influence of oxygen and carbon dioxide concentrations on the respiration of tomato fruits, F. G. GUSTAFSON (*Amer. Jour. Bot., 23 (1936), No. 6, 441–445, figs. 8*).—Reduction in respiration following decreased O_2 with increased CO_2 varied with the stage of fruit development. It retarded ripening without apparent injury.

The influence of different kinds of light and radiation on the development of crop plants [trans. title], J. VOSS (*Angew. Bot., 18 (1936), No. 1, pp. 43–75, figs. 15*).—The author reports the results of tests of the suitability of the sodium vapor lamp, mercury high pressure lamps of different types, the neon tube, and mixed lights (mercury and incandescent lamps) as light sources for the growing of crop plants (peas, oats, and summer wheat) in the absence of daylight, and of the effects of ultraviolet light on the germination and development of wheat.

The influence of radiation on light and dark seeds [trans. title], D. MEISCHKE (*Jahrb. Wiss. Bot., 83 (1936), No. 3, pp. 359–405, figs. 27*).—These studies were carried out on the seeds of five species of plants previously found to germinate best in the light and eight to germinate best in the dark. The tests were made with monochromatic light of wavelengths between 2,400 and 365 mμ, using various artificial light filters, simultaneous radiation with different spectral regions, light of different intensities, green leaves as light filters, and daylight.

The measurement of the intensity and the colour of the light in woods by means of emission and rectifier photoelectric cells, W. R. G. ATKINS, H. H. POOLE, and F. A. STANBURY (*Roy. Soc. [London], Proc., Ser. B, 121 (1937), No. 824, pp. 427–450, figs. 6*).—The optical conditions are considered, methods of measuring the photoelectric current in the field are described, and the wavelength sensitivity curves of the photoelectric cells used are plotted for a mean noon sunlight spectrum. For ecological work the illumination in shaded sites is considered best expressed as the "daylight factor", viz, the value of the vertical component of the illumination at any spot given as a percentage of the diffuse light in the open, which is nearly a constant.

In a wood consisting mainly of *Fagus sylvatica*, a number of sites examined showed daylight factors of from 2 to 5 percent. In such heavy shade the color factor was greatest for the deep red, and for green it was greater than for blue. There were indications of an absorption band in the near red. In such sites the radiation was about twice the daylight factor. It was found that whereas gray skylight showed an intensity maximum at 430 mμ light in heavy shade had its maximum at 760 mμ, with a minimum at 650 mμ and a secondary maximum at 550 mμ.

The effect of temperature on translocation from leaves, O. F. CURTIS and S. D. HERTY (*Amer. Jour. Bot., 23 (1936), No. 8, pp. 528–532*).—In this work at Cornell University, chilling the petioles of bean leaves to between 0.5° and 4.5° C. greatly reduced but did not stop transport of carbohydrate from the leaves. At 7°–11° distinctly more translocation occurred, but less than at 17°–24°. A significant amount took place when entire plants were placed at 0°–2°.

Gradients of freezing in foliage leaves [trans. title], J. GICKLHORN (*Protoplasma, 26 (1936), No. 1, pp. 90–96, figs. 2*).—This is a study of the differences in cold resistance in different parts of the same leaf, in which the author used *Magnolia*, *Helianthus*, *Rhododendron*, *Hedera*, *Cydonia*, *Sambucus*, *Mahoberberis*, *Rosa*, and *Helodea*.

Vernalization, F. G. GREGORY and O. N. PURVIS (*Nature [London], 138 (1936), No. 3484, p. 249*).—From experiments with excised cereal embryos it would appear that the "cause" of vernalization by low temperature lies entirely in the embryo.

Treating with mordants of the spring wheat seed under condition of yarovization, E. FOMIN and K. NOZDRACHOV (*Trudi Inst., Lab. Fitopat., Ukrain. N.-D. Inst. Zern. Gosp. (Bul. Inst., Dept. Phytopath., Ukrain. Sci. Res. Inst. Grain Cult.), No. 1 (1935), pp. 65–75; Eng. abs., pp. 74, 75*).—Spring wheat used for vernalization is said to undergo higher bunt infection than the nonvernalized seed. This is a progress report on the causes of this condition and on its control by seed treatments.

Tuberization of artichokes regulated by capping stem tips with black cloth, P. W. ZIMMERMAN and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, pp. 311–315, fig. 1*).—Potted artichokes (*Helianthus tuberosus*) were grown in summer in three lots: (1) Under normal day length, (2) entirely covered with black cloth from 4:30 p. m. to 9 a. m., and (3) with only stem tips capped with black cloth during the same hours. The first set developed long underground stems but no tubers. The other two sets developed tubers but no underground stems. Capping the stem tip, therefore, had the same effect as covering the whole plant to provide a shortened day, the controlling influence being centered in the growing tip, perhaps in the form of chemical regulators (hormones).

A study on the formation and nitrogen content of root tubercles of cowpea, M. L. DINGLASAN (*Philippine Agr., 25 (1936), No. 2, pp. 168–190, fig. 1*).—The nitrogen-fixing bacteria in the nodules examined appeared to be of one type, but the nitrogen content varied greatly with the character of the soil. Cultivation, soil sterilization, and fertilization also appeared to influence somewhat the nodulation and nitrogen fixation. Ammonium sulfate alone or with potassium sulfate gave low yields of nodules and total nitrogen, while superphosphate and potassium sulfate (separately or together) gave an increase. The production of nodules and total nitrogen in the nodules did not depend on the apparent vigor of the plants.

The sequence and climatic distribution of some plant acids, J. B. MCNAIR (*Amer. Jour. Bot., 23 (1936), No. 9, pp. 629–634*).—These studies on the order

in time of occurrence of oxalic, succinic, malic, tartaric, and citric acids in plants, in which analyses of a large number of species were made, led to the opinion that these acids may be formed from each other. Succinic acid is, perhaps, the mother substance, tartaric acid possibly being formed from malic, with tartaric and citric as the end products of the series, the former being more common in the tropics, the latter in the temperate zone. It is held likely that oxalic acid may result from drastic oxidation of the other acids mentioned.

Isolation of citric acid from potato tubers, J. D. Guthrie (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, pp. 295, 296*).—Citric acid, considered important in respiration, was isolated from potato tubers.

Grass seedling anatomy: The first internode of Avena and Triticum, L. Boyd and G. S. Avery, Jr. (*Bot. Gaz., 97 (1936), No. 4, pp. 765–779, figs. 6*).—A detailed study of the anatomy of the seedling axes of *T. vulgare* and *A. sativa* provides evidence for the following interpretations:

"The coleoptile is the first leaf above the single cotyledon; its divergence from the axis marks the coleoptilar node. The first internode, whether short (*Triticum*) or long (*Avena*), extends from the cotyledonary to the coleoptilar node. It has intermediate root-stem structure with two main endarch collateral bundles and numerous more or less transitional strands. The old term 'mesocotyl' implies that the first internode is part of the cotyledon; this is not the case, and the term should be dropped from the literature. The hypocotyl which lies between the cotyledonary plate and the upper limit of primary root structure is so short as to be practically negligible. The vascular relationships of seedling organs are discussed in some detail. The evidence from this study does not support recent theories which would make the epiblast-bearing grasses dicotyledonous or the seedling structure of Gramineae an anomaly among monocotyledons."

Bacterium-like amorphous patches associated with certain races of Neurospora, D. Pease (*Amer. Jour. Bot., 23 (1936), No. 9, pp. 612–618, pl. 1, figs. 3*).—Studies are reported on unexplained patches of amorphous, granular material found in agar cultures of a certain race of *Neurospora* at low pH. It is also reported that in 1- or 2-day-old cultures the entire contents of the hyphae often moved "with unbelievable rapidity, not only passing through transverse septa but passing from one hypha into another through pores in the walls of the adjacent filaments."

GENETICS

Chromosome structure X: An X-ray experiment, B. R. Nebel (*Genetics, 21 (1936), No. 5, pp. 605–614, figs. 3*).—First removing all the buds containing stages later than diakinesis, flowering heads of *Tradescantia reflexa* plants were radiated, at the New York State Experiment Station, with 50, 200, 500, and 1,000 r-units obtained from a Coolidge tube. The effects of radiation were correlated with the amount of dosage, and it was observed that at low dosages the effect was confined almost completely to lesions of the chromatids, whereas at higher dosages there was an increasing number of other lesions. With low dosage the indications were that the chromosomes are split in two previous to synapsis, while at higher dosages the chromosomes apparently split into four parts. The author interprets the findings as follows: "Each chromosome is composed of two split chromatids (or four half-chromatids) at all stages of presynapsis. In normal material the two half-chromatids that constitute a given chromatid lie very close to one another and do not

react individually. (The process of crossing over in *Tradescantia* is a reaction between chromatids in which every two half-chromatids behave as a physiological and mechanical unit.)

"Under low dosage of X-rays half-chromatids are physiologically unable to show separate reactions.

"With higher dosage of radiation (200 r-units and more) the spatial and physiological order of the threads within a chromosome is upset. Chromatic reactions may be recorded which affect one of four (or three of four) threads differentially. It is also indicated that with higher dosage chromatic reactions at a certain level of the chromosome may spread, involving sister and even homologous loci.

"The differential effect of higher dosage is thus attributed to action upon the immediate environment of the chromatin, perhaps to heat or to a general interference with the normal metabolism of the nucleus which in turn changes the type of reaction of the chromatin."

Chromosome behaviour in relation to genetics of Agave.—I, Seven species of fibre Agave, L. R. DOUGHTY (*Jour. Genet., 33 (1936), No. 2, pp. 197–205, figs. 4*).—The somatic chromosome complements of seven species and the meiotic behavior, in the pollen mother cell divisions, of five are described from studies at the East African Agricultural Research Station, Amani. A basic chromosome number of $x=30$ is inferred. The species most widely cultivated for fiber production are autopolyploids, i. e., *A. sisalana* and *A. fourcroydes*=$5x$, and *A. cantala* $3x$.

Breeding experiments indicated that the species are genetically heterozygous; structural hybridity and chromosome differentiation was indicated in the meiotic behavior. A certain degree of relationship between species in the group Rigidae, presumed from similarity in general characteristics and limited distribution, is supported by cytological and breeding evidence. The diploid species will cross with one another and with polyploid species. Sterility in certan species was shown to be partly functional and partly influenced by external conditions.

Chlorophyll deficiencies in Pennisetum typhoides (Stapf. & Hubbard), the pearl millet, G. N. R. AYYANGAR and P. V. HARIHARAN (*Madras Agr. Jour., 23 (1935), No. 10, pp. 394–397*).—Chlorophyll deficiencies resulting in pale and albino seedlings were found in pearl millet (*P. typhoideum*). The factor *C*, a simple dominant to *c*, produces chlorophyll, the seedlings being white and dying in its absence. *C* with *E*, a second factor, produces good green seedlings, while without *E* the plants are pale green and weak. *E*, a simple dominant to *e*, operates only when *C* is present.

Cytological studies of monosomic and derivative types of Nicotiana tabacum, H. P. OLMO (*Cytologia, 7 (1936), No. 1–2, pp. 143–159, figs. 21*).—The meiotic behavior of the univalent chromosome in monosomic ($2n$–1) types of *N. tabacum purpurea* (E. S. R., 73, p. 596) is described from studies at the University of California. Indications were that its abnormal behavior may provide opportunity for new chromosomal rearrangements. Various types of aberrant plants appearing in the progenies of the monosomic types described include trisomics, triploids, and others having various structural rearrangements of the chromosomes. "Monosomism creates a condition of genetical unbalance that may serve as the source of numerical or structural chromosomal recombinations."

The chromosome morphology, secondary association, and origin of cultivated rice, H. K. NANDI (*Jour. Genet., 33 (1936), No. 2, pp. 315–336, pl. 1, figs. 29*).—Chromosome numbers were determined at the University of London in 14 varieties of *Oryza sativa*. The apparent diploid number was $2n=24$ in all

the forms, there being no variation in number. *O. officinalis*, $2n=24$, has larger chromosomes than *O. sativa*. *O. minuta*, $2n=48$, is an allo-octoploid species which probably originated by hybridization (*O. officinalis* × *O. sativa*) followed by a chromosome doubling.

Detailed studies of *O. sativa* revealed 10 types of chromosomes which fall into 2 groups of 5 types each. Of these 10 types, 8 are present twice and 2 types are present 4 times, making a total of $2n=24$ in the diploid complex. During the heterotypic prophase, two unequal pairs of chromosomes with terminal satellites remain attached to the nucleolus until the nucleolus disappears complete at prometaphase. Pairing at diakinesis was by chiasmata. As meiosis proceeds the total number of chiasmata decreases, but the proportion of total chiasmata that are terminal increases from diakinesis to metaphase. The 12 bivalent chromosomes at early diakinesis differ in size and shape, the longest pair showing 3 chiasmata and the smallest 1 chiasma. Secondary pairing occurs among the bivalents at metaphase I or univalents at metaphase II. The minimum number of groups of bivalents or univalents is 5, which is deemed the primary chromosome number in *Oryza*. Of these 5 groups when secondary pairing is at maximum, 2 are made of 3 and 3 of 2 bivalents or univalents each. *O. sativa* is therefore a secondary balanced polyploid. In the heterotypic and homotypic metaphase the groups of secondarily paired bivalents or univalents act as single bodies, and in most cases arrange themselves in agreement with the stable form of arrangement of the corresponding number of floating magnets.

"Somatic chromosome analysis, meiotic chromosome behavior, together with the published evidence from haploid rice indicate that *O. sativa* is a secondarily balanced allotetraploid which originated through hybridization between two different five-paired species in which two chromosomes were duplicated, probably due to meiotic irregularities in the hybrid. This followed by a subsequent doubling of the chromosomes attained the secondary balance of $n=12$, the present existing number in *O. sativa*."

Inheritance of grain shattering in rice (Oryza sativa), K. Ramiah and K. Hanumantha Rao (*Madras Agr. Jour., 24 (1936), No. 7, pp. 240–244*).—Crosses between shattering and nonshattering types of rice did not reveal in F_2 any simple inheritance, although the correlation between number of grains shed in F_1 and in F_2, $r=0.48\pm0.023$, suggested that but few factors were involved.

The inheritance of red pericarp colour in rice (Oryza sativa), K. Ramiah and C. Rajasekhara Mudaliar (*Madras Agr. Jour., 23 (1935), No. 7, pp. 268, 269*).—Crosses between red and white rice produced a 15:1 ratio of red to white in F_2, indicating that two factors were involved for color.

Hybridization of Triticum and Agropyron, I, II (*Canad. Jour. Res., 14 (1936), No. 5, Sect. C, pp. 190–202, pl. 1, figs. 6; pp. 203–214, pls. 2, figs. 2*).—Two contributions are presented.

I. ***Crossing results and description of the first generation hybrids***, J. M. Armstrong.—Two species of tetraploid wheat ($2n=28$), Vernal emmer and Mindum, and three hexaploid ($2n=42$) wheats of *T. vulgare* were crossed with *A. glaucum* ($2n=42$) and *A. elongatum* ($2n=70$), with an average crossing success of 18 percent. The seed from tetraploid wheat × *A. glaucum* was slightly plumper and germinated better than that from tetraploid wheat × *A. elongatum*, whereas hexaploid wheat × *A. elongatum* gave decidedly plumper and better germinating seed than hexaploid × *A. glaucum*. When grown under greenhouse conditions the F_1 hybrids proved self-sterile and perennial, with hybrid vigor strongly marked. The hybrids were, in general, intermediate in morphological characters, but resembling *Agropyron* somewhat more than wheat. This dominance, whole or partial, was more noticeable in the *A.*

elongatum than in the *A. glaucum* crosses. Dominance phenomena are discussed in relation to current theories.

II. *Cytology of the male parents and* F_1 *generation*, F. H. Peto.—Meiosis was studied in *A. glaucum*, *A. elongatum*, and in the F_1 of these species crossed on varieties of *T. dicoccum*, *T. durum*, and *T. vulgare*. In *A. glaucum* a large proportion of the chromosomes formed bivalents with occasional univalents and quadrivalents. *A. elongatum* was very unusual in that uni-, bi-, tri-, quadri-, sexa-, and octavalent configurations were observed. The *A. glaucum* × *Triticum* hybrids usually averaged 4.8–6.2 bivalents per nucleus, thus indicating partial homology between one set of chromosomes from each of the parents. In *A. elongatum* × *Triticum* hybrids, numerous multivalent configurations were observed, suggesting that auto- as well as allosyndesis had occurred. Approximately one set of chromosomes remained unpaired in one collection of Vernal emmer × *A. elongatum*, and approximately two sets remained unpaired in crosses between three varieties of *T. vulgare* and *A. elongatum*. Two crosses exhibited an abnormally small amount of pairing, an effect attributed to the reaction of genetic factors limiting prophase pairing.

Tentative conclusions were made on the origin and genetic constitution of *A. elongatum* from the pairing behavior of the chromosomes in this species and its hybrids. "It appears likely that *A. elongatum* arose through hybridization between hexaploid and tetraploid species of *Agropyron* with subsequent chromosome doubling."

Development of the male gametes of Lilium, D. C. Cooper (*Bot. Gaz.*, *98 (1936), No. 1, pp. 169–177, figs. 31*).—Studies at the University of Wisconsin of the nuclei of the generative cells of *Lilium regale*, *L. auratum*, and *L. philippinense* showed the typical mitotic division with the production of two male gametes. The generative cell was divided by a cell plate and the two gametes were seen to be distinct, fully organized cells. A distinct spindle was observed, and three of the chromosomes had median or submedian fiber attachments and the others had subterminal attachments.

[Papers in animal genetics] (*Amer. Soc. Anim. Prod. Proc., 1935, pp. 209–214, 217–237, fig. 1*).—The following papers were briefly presented before the genetics section of this society: Some Developments in Overshot and Undershot Jaw Studies in Sheep, by J. E. Nordby (pp. 209–211); The Dairy Cow in the Tropics, by A. O. Rhoad (pp. 212–214); The Role of the Gonad-stimulating Hormones in Reproduction, by H. R. Catchpole (pp. 217–222); The Physiology of Spermatozoa, by R. W. Phillips (pp. 222–235); and Some Practical Applications of Endocrinology to Animal Husbandry, by S. A. Asdell (pp. 235–237).

The inheritance of white facial markings in Arabian horses, C. T. Blunn and C. E. Howell (*Jour. Heredity, 27 (1936), No. 8, pp. 293–299, fig. 1*).—The California Experiment Station has studied the facial markings in 477 Arabian horses. The markings have been designated as star, strip, snip, and chin spot, depending upon the part of the face involved. The results obtained in two series of matings give strong evidence that these characters do not compose an allelomorphic series. Each pattern seems to be conditioned by modifying factors of a general factor for white markings. The star, strip, and snip patterns apparently are inherited as dominant characters, while chin spot appears to be recessive.

A new lethal factor in the horse, R. Prawochenski (*Jour. Heredity, 27 (1936), No. 11, pp. 410–414, figs. 3; abs. in Nature [London], 137 (1936), No. 3478, p. 869*).—A three-fourths Arabian stallion produced 26 foals, of which 8 showed lameness as foals and had one or both forelegs defective with typically crooked immobile phalanxes and were unable to stand. Because of the frequent occur-

rence of the abnormality and failure to locate common ancestors of the stallion and the mares producing the deformed foals, it is assumed that the condition is not due to a simple recessive gene. Suggestion is made that it might be a gene deficiency which behaves as a dominant to the normal.

Small-animal breeding (*U. S. Dept. Agr., Bur. Animal Indus. Rpt., 1936, p. 7*).—Results are briefly presented on the inbreeding experiments with guinea pigs and histological studies of the hypophysis from these strains, together with inbreeding experiments with rabbits.

The trichogenic action of the sulfhydryl group in hereditary hypotrichosis of the rat, G. J. Martin and R. E. Gardner (*Jour. Biol. Chem., 111 (1935), No. 1, pp. 193–196, fig. 1*).—The test animals used in this study were from a strain of hairless rats in which it had been demonstrated that the hypotrichosis was due to a single recessive factor. Three groups of these rats received a daily allowance of glutathione, cystine, and cysteine, respectively, as supplements to their basal diet. The glutathione gave no response. The cystine stimulated hair growth, but this was shed in a short time and no further hairy growth occurred, while the cysteine stimulated growth of a complete hair coat which was maintained throughout the balance of the trial. From these results it is concluded that cysteine through the sulfhydryl group stimulated the hair follicle, resulting in a trichogenic action in hereditary hypotrichosis of the rat.

[Poultry breeding and physiological investigations] (*U. S. Dept. Agr., Bur. Animal Indus. Rpt., 1936, pp. 18, 19*).—Results are briefly presented on the sex-linked recessive gene for dark pigmentation in White Silkies; artificial insemination of turkey eggs with sperm from purebred and cross-bred chickens; prolactin content of the pituitaries of laying hens of different strains; relationship of hardiness to abnormal incubation temperatures and genetic constitution; successful artificial insemination of hens with 0.1 cc of mixed semen from several cockerels on alternate days; unfavorable effect of tremulous air cells on hatchability; and relationship of season of the year, growth of the bird, and individual characteristics of the hen to percentage of thick albumen in eggs.

Studies on the inheritance of persistency, F. A. Hays (*Genetics, 21 (1936), No. 5, pp. 519–524, figs. 5*).—In an experiment at the Massachusetts Experiment Station, high and low persistency lines of Rhode Island Reds were crossed. The F_1 generation showed a wide scatter in frequency distribution with regard to persistency, although there was evidence of the dominance of high persistency. The F_2 generation showed a typical bimodal distribution for length of biological year with modes at about 200 and 350 days, with a dividing line between the two populations at about 270 days. From backcrosses and reciprocal crosses data were obtained indicating that high persistency depends in inheritance upon a single dominant autosomal gene. It is suggested that in selecting breeding stock for high persistency the standard be placed well above a 270-day minimum because of overlapping in phenotypes.

Sexual dimorphism in Single Comb Rhode Island Red down color, T. C. Byerly and J. P. Quinn (*Jour. Heredity, 27 (1936), No. 8, pp. 319–322, fig. 1*).—In this study at the U. S. D. A. Bureau of Animal Industry, 1,102 Single Comb Rhode Island Red chicks and fully developed embryos were examined for evidence of black spotting or striping on the head. Of the total number examined 524, or 47.5 percent, had some black down on the head. A classification of the population with regard to sex showed that 84.9 percent of the spotted or striped chicks were females and 77.8 percent of the normal or nonspotted chicks were males. On this basis sex could be distinguished by color markings in 81.2 percent of the chicks examined. Examination of 663 chicks in another standard bred Rhode Island Red flock showed 42.1 percent to be spotted or striped, indicating that these characters are widely distributed among this breed.

[Studies in physiology of reproduction in animals at the Missouri Station] (*Missouri Sta. Bul. 370 (1936), pp. 17–19*).—Brief results are given on investigations of the occurrence of ovulation in the ewe, by F. F. McKenzie and C. E. Terrill; cytological changes in the anterior lobe of the pituitary in ewes during the oestrous cycle, and cytological study of the pineal body of the ewe, both by McKenzie and V. Warbritton; the discovery of a small gland in the pineal body of a sheep, by Warbritton; the afterbirth as an index to the thrift of the lamb, by McKenzie and R. Bogart; the induction of oestrus in a senile mare by the administration of serum from a pregnant mare, by McKenzie, Terrill, and L. R. Richardson; seasonal variations in libido and fertility of rams and the influence of feeding, by McKenzie, V. Berliner, and M. E. Vaughan; and stimulation of sperm production in a young sterile bull by the administration of Antuitrin S (a human pregnancy urine preparation), by McKenzie and Berliner, and pregnancy mare serum, by McKenzie and Terrill.

A study of the chromosomic elements of the follicular epithelium of the ovaries of birds [trans. title], J. Homedes i Ranquini and J. Martin de Frutos (*Arxius* [*Barcelona*], *n. ser., 2 (1936), No. 2, pp. 305–316, figs. 7; Eng. abs., p. 316*).—This report deals with hen and pigeon ovaries at different stages of ovulation. An abnormal behavior of the chromosomes was observed in some of the miotically reproduced epithelial cells. In these cases the chromosomes are much shorter and thicker than normal, and the chromosome number is always inferior to the diploid, being generally nearer the haploid. The numerical variations observed ranged from 33 to 44 chromosomes in the hen and from 32 to 42 chromosomes in the pigeon. It is believed that these originate as a consequence of an increase or decrease of microchromosomes, with evidence that such anomalies are brought about by a mechanism of miotic type.

It is suggested that such deviation from the typical condition may be the result of an impregnation of the cells by the oestrogenic hormone, causing a miotic stimulus of pathological type.

Survival of deciduomata in the unilaterally pregnant rat, R. A. Lyon and W. M. Allen (*Anat. Rec., 65 (1936), No. 3, pp. 351–356, figs. 4*).—In a histological study of the genital tract of unilaterally castrated pregnant rats made from the eighth to the twentieth day of gestation, it is shown that the deciduomata in the sterile horn undergoes progressive degeneration, usually beginning on the tenth to twelfth day. By the twentieth day there was only scant evidence of the preexisting deciduomata. This indicates that the fetal part of the placenta, by its attachment to the endometrium, plays some role in the maintenance of the decidua.

On the relation between the site of injection of androsterone and the comb response in the fowl, A. W. Greenwood and J. S. S. Blyth (*Quart. Jour. Expt. Physiol., 25 (1935), No. 3, pp. 267–277, figs. 2*).—This report from the University of Edinburgh shows that the injection of a total of 2 mg of androsterone (divided into five daily doses) directly into the comb of capons produced a greater response in increasing the size of the comb than was obtained from the same dose injected intramuscularly in the pectoral region.

In further tests injections of the hormone into the comb of normal hens caused an increase in comb size, although less than that obtained in capons, while intramuscular injections were ineffective. Intracomb injections into a normal male showed no reaction, while an incompletely castrated male gave a marked response.

Effects of oestrin injections on accessory reproductive organs of the male ground squirrel (*Citellus tridecemlineatus*), L. J. Wells (*Anat. Rec., 64 (1936), No. 4, pp. 475–497, pls. 3*).—Injections of oestrin into both normal and castrated males during the season of low sexual activity resulted in gross hyper-

trophy of all accessory sexual organs. The response of such injections gave morphological evidence of the apparent transformation of connective tissue elements into epithelial-like cells, particularly in the secretory tubules of the prostate gland and to a lesser extent in the bulbar gland, Cowper's gland, Cowper's ducts, and prostatic ducts. An increase in connective tissue and smooth muscle was also observed in the seminal vesicles, epididymis, and ductus deferens. In contrast, oestrin injections during the breeding season, and consequently acting on the accessories that were simultaneously affected by large quantities of male hormone, resulted in a decrease in size and great damage to all accessory organs.

Studies on the gonad-hypophyseal complex in estrin-injected rats, S. R. Halpern and F. E. D'Amour (*Amer. Jour. Physiol., 115 (1936), No. 1, pp. 229–238, figs. 4*).—Two groups of mature rats each, including normal males, normal females, and ovariectomized females, were given daily injections of oestrin for 4- and 8-week periods, respectively. During the period of investigation the gonads showed a progressive loss in weight and progressive degeneration of the germinal elements, the effect being most pronounced in males. Eight weeks' injection gave a degree of degeneration comparable to that occurring after complete hypophysectomy. The mammary gland underwent extensive proliferation and contained secretion, and the hypophysis increased in weight from about 100 to 200 percent during a period of oestrin administration. It is suggested that oestrin stimulates the release of the gonadotropic hormone in normal animals.

Effects of two hypophyseal gonadotropic hormones on the reproductive system of the male rat, R. O. Greep, H. L. Fevold, and F. L. Hisaw (*Anat. Rec., 65 (1936), No. 3, pp. 261–271, pl. 1*).—In further studies on the gonadotropic hormones of the pituitary (E. S. R., 75, p. 613), the effects of the follicle-stimulating and the luteinizing hormones when injected alone or in combination on the gonads and secondary sexual structures of normal and hypophysectomized immature male rats has been determined.

The follicle-stimulating hormone stimulated rapid proliferation of the germinal epithelium but did not affect the interstitial cells or accessory sex organs. The luteinizing hormone caused a marked development of interstitial cells, invariably followed by enlargement of the accessory organs, but did not hasten proliferation of the germinal epithelium. When the two were injected simultaneously both the tubules and the interstitial cells were stimulated, and the accessory organs were much larger than would be produced by a like amount of the luteinizing hormone acting alone. The fact that these hormones have just as definite and as dissimilar effects on the male gonads as on the female gonads indicates that the active principle in each is not sex specific in its activity.

The gonad-stimulating activity of pituitary glands from horses of different ages and sex types, A. A. Hellbaum (*Anat. Rec., 63 (1935), No. 2, pp. 147–157, figs. 6*).—With further reference to the gonadotropic activity of the pituitaries of horses (E. S. R., 70, p. 34), the gonad-stimulating ability of the pituitaries from young, old, and pregnant mares, geldings, stallions, colts, and fetuses has been assayed. Pituitaries from young nonpregnant mares and young geldings caused marked luteinization, whereas those from old mares and old geldings produced primary follicles. In each of these cases the size of the ovary exceeded the average produced by the composite hypophyseal powder used as a check. Pituitaries from stallions gave follicular development, but the ovary attained only about one-fourth the size of that from geldings. Extracts from colts and fetuses induced both follicles and corpora, although the ovaries were comparatively small. Results from pregnant mares were extremely variable depending upon the stage of gestation.

The effect on the chick of some gonadotropic hormones, W. R. Breneman (*Anat. Rec., 64 (1936), No. 2, pp. 211–220*).—This contribution describes a series

of tests in which various gonadotropic hormones were administered to young chicks and their effects on gonad development noted. The follicle-stimulating hormones (pig) and pregnant mare serum stimulated maximum gonad development in both males and females. The luteinizing hormone and tannic acid preparations of pregnancy urine caused marked weight increases in both testes and ovaries, the response to each being similar. Prolactin did not significantly decrease gonad weights in either sex, and in a few cases there was evidence of stimulation. The stimulating action of the follicle-stimulating hormone is partially inhibited by admixture with any of the other extracts used in this series. It is evident that the chick ovary at from 5 to 15 days of age is readily susceptible to stimulation.

The follicular apparatus of the ovary of the hypophysectomized immature rat and the effects of hypophyseal gonadotropic hormones on it, C. E. Lane and R. O. Greep (*Anat. Rec., 63 (1935), No. 2, pp. 139–146, fig. 1*).—Continuing this line of investigation (E. S. R., 74, p. 326), immature female rats hypophysectomized at 28 days of age were killed in groups of three at periods ranging from 1 to 38 days postoperation. Increased ovarian activity was noted to the fourth day after operation, followed by a gradual and uniform degeneration of the ovaries over the remainder of the period, as indicated by a decreased weight of the ovary and also a decrease in number of both primary and vesicular follicles. The fourth-day peak is attributed to pituitary materials forced into circulation while removing the gland. Injections of the follicle-stimulating hormone resulted in an increase in total follicle count but a decrease in vesicular percentage, whereas injection of the luteinizing hormone did not affect the total follicle count but markedly increased the percentage of vesicular follicles.

The effect of progestin on the in vitro response of the rabbit's uterus to pituitrin, A. W. Makepeace, G. W. Corner, and W. M. Allen (*Amer. Jour. Physiol., 115 (1936), No. 2, pp. 376–385, figs. 8*).—Results obtained in these in vitro experiments indicate that the addition to the medium of progesterone, either in natural form as extracted from pig ovaries or the synthetic product prepared from stigmasterol, results in inhibition of the reaction of the rabbit uterus to pituitrin. Since the degree of progestational proliferation of tho endometrium is generally accepted as a means of assaying for progesterone potency, it appears that endometrial proliferation and pituitrin desensitization are both physiological properties of progesterone.

The effect of gonadectomy on body structure and body weight in albino rats, H. Holt, R. W. Keeton, and B. Vennesland (*Amer. Jour. Physiol., 114 (1936), No. 3, pp. 515–525, figs. 3*).—Comparing the growth rates of normal and gonadectomized albino rats, it is shown that spayed females gained and maintained greater weight than the normal controls. This more rapid development was characterized by increase in skeletal growth and a general increase in size rather than by any increase in deposition of fat. Gonadectomy in the female apparently favorably influences the growth process, presumably through the growth hormone of the anterior lobe of the hypophysis. In males, variations in weight between normal and castrated individuals were neither predictahle nor significant.

Effect of ovarian transplants upon the development and maintenance of the seminal vesicle and prostate gland of the albino rat, C. A. Pfeiffer (*Anat. Rec., 65 (1936), No. 2, pp. 213–237, figs. 12*).—In cases of male rats castrated at birth and receiving ovarian transplants either at birth or at puberty, the smooth muscle of the seminal vesicles is hypertrophied in such a manner that it resembles that of the uterus in cross section. There is also a tendency toward a stratified squamous epithelium. The coagulation gland shows

a stimulation of smooth muscle and the formation of stratified squamous epithelium, which in extreme cases becomes cornified and undergoes all the changes of the vaginal epithelium during oestrus. The prostate gland is hypertrophied and also shows evidence of metaplasia. Both follicles and corpora lutea are produced in the ovarian graft. When the animals are castrated at puberty and ovarian grafts made at the same time, the only observed effect of the transplant is an increase in the smooth muscle of the seminal vesicles. In this case only follicles are produced in the ovarian tissue, as is true with transplants in a normal male.

The experimental induction of oestrus (sexual receptivity) in the normal and ovariectomized guinea pig, E. W. Dempsey, R. Hertz, and W. C. Young *(Amer. Jour. Physiol., 116 (1936), No. 1, pp. 201–209).—In this experiment various gonadotropic hormones were used singly and in combination in an attempt to experimentally induce oestrus in guinea pigs.* Injections of theelin alone were followed by sexual receptivity in 31 percent of the spayed females and only 14 percent of the normal females. Divided injections of small quantities were not more effective than a single injection of a large quantity. Injections of the luteinizing hormone into normal females on the twelfth to fifteenth days of dioestrus produced heat in a large number of cases, but were ineffective when injected earlier in the cycle. Similar injections of the luteinizing hormone singly and in combination with oestrin were ineffective in spayed females. Injections of small doses of oestrin followed from 36 to 48 hr. later by injections of progesterone invariably produced heat in the spayed females. These results led to the postulation that in the guinea pig, after conditioning with oestrin, oestrus is caused by the action of progesterone produced from the ripening follicles under the influence of the luteinizing hormone.

[Studies on the physiology of lactation at the Missouri Station] *(Missouri Sta. Bul. 370 (1936), pp. 36–42).*—Brief reports are given on the artificial initiation of lactation and its continuance in female and male rabbits by suckling young, by C. W. Turner and A. J. Bergman; the further purification of the lactogenic hormone, galactin, and the response of the common pigeon to different injections of the lactogenic hormone, both by Turner and H. McShan; the failure to extract lactogenic hormone from bovine urine, by Turner and R. P. Reece; the inhibition of subsequent growth of mammary glands of immature rabbits by irradiation, by Turner and E. T. Gomez; the normal development of the udder of the goat, by Turner, Gomez, and E. P. Reineke; the failure of ovariectomy to influence lactation in the albino rat, and the apparent absence of lactogenic hormone in pituitaries of turkeys, geese, and ducks, both by Turner and Gomez.

***The sterility in rabbits produced by injections of oestrone and related* compounds,** G. Pincus and R. E. Kirsch *(Amer. Jour. Physiol., 115 (1936), No. 1, pp. 219–228, fig. 1).*—Rabbits were found to be most susceptible to oestrone sterilization on the third to fourth day postcoitum, injections of 150 rat units of oestrone in oil at this period resulting in complete prevention of implantation of the embryos. Injections of 200 rat units on the fifth to sixth days postcoitum resulted in only partial prevention of implantation as did less than 150 units on the third to fourth days. Injections of large amounts of oestrone both before and during cleavage did not affect the normal cleavage rate, and ova cultivated in vitro with oestrone in the medium go through cleavage at the normal rate. Oestriol is about one-fourth to one-fifth as effective as oestrone in preventing implantation, while dihydro-oestrone is approximately three times as effective as oestrone in this respect.

Is voluntary sex determination in the hen possible through sex hormones? [trans. title], F. Økland *(Biol. Zentbl., 56 (1936), No. 3–4, pp.*

147–150).—In this experiment an attempt to control the sex in chicks by administering varying doses of the female sex hormone "ovifollin" to hens gave completely negative results.

The identification of the sex of beavers, F. W. Young (*Michigan Sta. Spec. Bul. 279 (1936), pp. 8, figs. 6*).—Determination of the sex of beavers is described based first on properly restraining the animal in a 10-in. pipe and then by visual examination or by palpation in the urino-genital orifice.

FIELD CROPS

[**Crops research of the U. S. Department of Agriculture, 1936**] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1936, pp. 87–93*).—Outstanding results are reported from improvement research with cotton, wheat, oats, corn, sorghum, and lettuce; study of soil moisture in relation to wheat production in the central Great Plains; experiments on chlorosis of rice due to deficiency of iron; ecological studies to determine effects of heat and drought on native grasses in the Great Plains; pasture experiments with woolly fingergrass in comparison with other grasses; fertilizer placement tests with cotton and tobacco; and reinforcement of cotton fertilizers with magnesium and calcium neutralizing agents. Much of the work was in cooperation with State experiment stations.

[**Research with field crops in the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1936, pp. 2, 3, 4, 5, 6, 7, 8, 11, 12, 14, 15, 16, 17, 18*).—The progress and accomplishments are reported on briefly from agronomic investigations, including breeding work with corn, wheat, oats, barley, grain sorghum, rice, cotton, sugarcane, sugar beets, potatoes, alfalfa, crotalaria, and tobacco; cultural (including planting) tests with oats, potatoes, and sweetpotatoes; tests of the value of *Lespedeza sericea* for different purposes, of the adaptation of a new early lespedeza (No. 19604), and of woolly fingergrass; effects of heat and drought on native grasses in the Great Plains; fertilizer work, including placement experiments, with cotton, potatoes, and tobacco; fertilizers reinforced with magnesium and calcium for cotton and high nitrogen fertilizer mixtures for sugarcane; improved methods of ginning long-staple cotton; community production of cotton; extension of production of sugar beet seed; study of soil moisture in relation to wheat production in the central Great Plains; maintenance of soil productivity in irrigated regions by manure and pastured alfalfa in the rotation; irrigation water requirements of important field crops; study of germination of seed stored under various temperature and moisture conditions; and control of bindweed. Many studies were in cooperation with State experiment stations.

[**Agronomic research in Arkansas**], M. Nelson, C. K. McClelland, L. C. Kapp, L. M. Humphrey, B. P. Johnson, J. R. Cooper, and V. M. Watts (*Arkansas Sta. Bul. 337 (1936), pp. 13–26, 29–37, 53, 54*).—Progress results are reported from experiments with field crops (E. S. R., 74, p. 771) at the station and substations, including variety trials with cotton, corn, wheat, winter and spring oats, barley, rice, grain sorghum, and soybeans and cowpeas for seed and hay; breeding work with cotton; fertilizer trials with cotton, rice, potatoes, and sweetpotatoes; use of lime; winter hardiness experiments with oats; cultural (including planting) tests with corn, oats, rice, and soybeans; effects of various treatments on duration of alfalfa stands; residual effects of winter cover crops sown in cotton middles on subsequent cotton yields; interplanting of legumes in corn and effects on yields of the succeeding crop of oats and cotton; control of rice weeds; rice yields following corn, cotton, and soybeans and response of these crops to irrigation; effect of fertilizers on yield and growth of rice; cover crops for rice; toxic effects of iron and manganese on

rice grown in nutrient solutions; cotton fiber investigations, including the development of a method of sorting fibers as to length by a photoelectric cell, and quality of fiber of pure lines of cotton; study of methods of manufacturing sorgo sirup; and pasture studies. The cotton fertilizer studies dealt wtih different formulas, rates of application, placement, home v. factory mixed, side dressing, and nitrogen carriers.

[**Field crops work in Delaware**], G. L. Schuster and C. E. Phillips (*Delaware Sta. Bul. 203 (1936), pp. 13, 14*).—Fertilizer and breeding experiments wtih wheat and trials of soybean introductions are reviewed briefly.

[**Field crops work in Michigan**] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 31–33*).—Brief accounts of agronomic research not noted earlier report on the production of better alfalfa hay and avoidance of winter injury by timely cutting and improvement of old stands with grass; good pasture from alfalfa-bromegrass mixture; Sudan grass seed production; increasing sugar beet yields by transplanting; tests of promising new potato seedlings; plowing sweetclover under early for beans; and comparisons of colored bean types.

[**Field crops experiments in Missouri**], C. W. McIntyre, L. J. Stadler, G. F. Sprague, B. M. King, W. C. Etheridge, E. M. Brown, and J. M. Poehlman (*Missouri Sta. Bul. 370 (1936), pp. 50, 55–61*).—Progress results (E. S. R., 75, p. 36) are reported from breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; genetic studies with corn; experiments on the production of genetic variations by radiation of pollen with ultraviolet rays and on the mechanism of gene rearrangement induced by X-ray treatment; variety trials with wheat, barley, soybeans, oats, and cotton; tests of strains of English grasses selected for leafiness; and comparisons of grazing systems and fertilizer tests with pasture. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[**Agronomic work in Montana**] (*Montana Sta. Rpt. 1935, pp. 26–28, 36–41, fig. 1*).—Agronomic activities related to the livestock industry in Montana, reviewed briefly, included the regrassing of abandoned land; variety tests of barley, oats, spring wheat, and rye for feed grain on irrigated and dry land; trials of wheat and oats for hay; tests of the merits of Ladak alfalfa; determination of good grass mixture, the merits of proper irrigation and grazing, and the value of manuring irrigated pasture; and growing and using crested wheatgrass for pasture and production of its seed under irrigation. Several lines of work were in cooperation with the U. S. Department of Agriculture.

The influence of temperature and available nitrogen supply on the growth of pasture in the spring, G. E. Blackman (*Jour. Agr. Sci. [England], 26 (1936), No. 4, pp. 620–647, figs. 9*).—Studying the principal factors controlling the growth of pasture in the spring, the author found that below a soil temperature at 4 in. of approximately 42° F. no growth took place. Between 42° and 47° nitrogen-manured pasture grew at a greater rate than the control, but at higher temperatures the growth rates were very similar. The manured herbage reached the grazing stage sooner than did the control. Nitrogenous fertilizers brought about marked changes in the nitrogen content of the herbage.

Below 42° temperature is the factor controlling growth. The greatest response to nitrogenous manuring may be expected when the soil temperature rises slowly from 42° to 47°, and conversely the smallest response when the rise between these temperatures is rapid.

Changes in the proportions of the components of seeded and harvested cereal mixtures in abnormal seasons, K. H. W. Klages (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 935–940, figs. 2*).—Mixtures of Marquis, Ceres, and Reward hard red spring wheat with Mindum durum and of Richland oats

with Odessa barley, compounded at the South Dakota Experiment Station in proportions ranging from 1 to 99 percent, were grown in 1935 in comparison with pure stands of the several varieties. Exceptionally large increases in the durum components of durum-hard red spring wheat mixtures were observed, and the barley components of various combinations of oats and barley increased materially over the percentage of barley planted. These changes in mixture components, exceeding expectations, were explained by the particular growing conditions and by the occurrence of one of the severest stem rust epidemics on record in the northern portion of the Great Plains area.

The relation of reserves to cold resistance in alfalfa, J. J. Mark (*Iowa Sta. Res. Bul. 208 (1936), pp. 301–335, figs. 14*).—To obtain more quantitative data on the relation of reserve levels to winter hardiness in alfalfa and to determine the type of differentiation reactions stimulated by high sugar levels and considered as actually responsible for cold resistance, experiments were made with Grimm alfalfa, fall clipped to induce varying reserve levels and also with varieties of known cold resistance.

The cutting of Grimm alfalfa in late August and early October prevented normal fall accumulation of reserve proteins and carbohydrates and resulted in complete winter-killing of plants during the winter of 1934–35. Roots of plants not cut after August 29 were 75 percent larger than those cut a second time on October 8. The roots of early cut plants also contained about 80 percent more carbohydrate and nitrogenous reserves on a green weight basis. The percentage of both soluble and insoluble nitrogen was higher in uncut than in cut plants throughout the test. No evidence that protein splitting was a factor in cold resistance was obtained.

Reducing sugars constituted a progressively smaller portion of the root reserves as fall advanced, while nonreducing sugars (sucrose) increased during the fall and were constant during winter with a slight increase toward spring. Starch began to disappear in early fall and constituted a very small portion of the root reserves in any variety after October. Digestion was most rapid in the hardy varieties. Analyses for starch in the spring showed no tendency toward reconversion of sugar to starch.

Analytical data provided no criteria by which the varieties could be ranked in order of hardiness as exhibited in field tests. Nonhardy varieties consistently exceeded the hardier ones in certain reserve fractions, whereas hardy varieties did not significantly surpass the nonhardy groups in any reserve fraction. The pectin and water-soluble gum fractions showed fluctuations among varieties that would not currently justify their use as indexes of hardiness of varieties.

The positive correlation between reserves and hardiness within a variety (Grimm) and lack of correlation when comparing varieties is considered to support the protoplasm differentiation hypothesis of winter hardiness. This assumes as prerequisites to the development of winter hardiness both an available reserve and a genetic ability to use these reserves in building a stable protoplasm.

Barley varietal trials at East Lansing, J. W. Thayer, Jr., and H. C. Rather (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 97–100, figs. 2*).—Wisconsin No. 38 and Spartan barleys, both smooth awned, have been outstanding in station tests. Wisconsin No. 38 is the best commercially available barley for sale for malt and also the highest yielder, whereas Spartan finds its place as a pearling and feed barley. Spartan surpasses other varieties tested in its much stiffer straw and as a nurse crop for seedings of alfalfa, sweetclover, red clover, and other forage crops.

Row competition and its relation to cotton varieties of unlike plant growth, N. I. Hancock (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 948–957, fig. 1*).—An attempt was made at the Tennessee Experiment Station to induce row competition by planting two cottons differing materially in morphological characters in different combinations of single-row plats (66 by 3 ft.) so that full and partly full expressions of their plant growth might be reflected upon each other. Each combination was in the trials 43 times during the years 1930–32, 1934. An effect from the unequal plant growth was evident. As expected, the small, less vigorous Delfos 6102 between its own border rows yielded more than when planted between the tall, vigorous California Acala. Likewise, the Acala, when placed between its own border rows had more competition and yielded less than when placed between Delfos. The extreme growth differences of these varieties also reacted the same way under the variable seasonal conditions. Plant competition in cotton would become an additive factor if the average were taken over a period of years. However, for a given season the degree of this effect was small and not significant in the Delfos combinations. Usually it was fairly large in the Acala combinations but of small significance. It is suggested that two-row plats be used for cotton varietal trials on soil of medium fertility.

Registration of improved cotton varieties, I, H. B. Brown (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 1019, 1020*).—Cotton varieties registered as improved varieties and assigned registration numbers include Deltapine, formerly known as D. & P. L. 11, originally a plant selection from a hybrid between a noncommercial hybrid and D. & P. L. 10; Ambassador, formerly known as Stoneville–4, originally selected from Lone Star–65; and Washington, formerly known as Delfos–719, originally selected from Delfos 6102–324. Adaptations and characteristics are described briefly. See also an earlier note (E. S. R., 74, p. 629).

A report on the production of cotton in the Panhandle of Oklahoma, H. A. Daniel (*[Oklahoma] Panhandle Sta., Panhandle Bul. 61 (1936), pp. 13–16*).—Yields secured in variety trials with cotton, 1924–36, at Goodwell are reviewed, supplementing an earlier report (E. S. R., 62, p. 829). Since the annual yield of seed cotton averaged only 202.1 lb. per acre during the period, cotton apparently cannot be grown economically in competition with wheat and sorghum in the southern high plains. Early frost and low temperature killed the plants before maturity in four different seasons during the period, indicating that the growing season at Goodwell is too cold and short for cotton production. Delfos 2 made the highest average yield, followed by Lightning Express and Oklahoma 44–11.

Fertilizer placement for potatoes, B. E. Brown and G. A. Cumings (*Amer. Potato Jour., 13 (1936), No. 10, pp. 269–272*).—Fertilizer placement experiments since 1931 (E. S. R., 73, p. 609), conducted cooperatively by the Maine, Michigan, New Jersey, New York, Ohio, and Virginia Truck Experiment Stations, the U. S. Department of Agriculture, and the Joint Committee on Fertilizer Application, consistently have indicated side placement to be best for potatoes in a number of important producing sections. Conclusions were that the placement of fertilizer in a narrow band at each side of the row about 2 in. away and on a level with or slightly below the seed piece should be a recommended practice. Potato planters with suitable fertilizer placement equipment are available, and many growers have adopted the side placement method of fertilizer application.

A discussion of potato sprout emergence as related to fertilizer placement, G. V. C. Houghland (*Amer. Potato Jour., 13 (1936), No. 12, pp. 343–*

346).—Emergence data recorded and field observations made in cooperative experiments indicated that slow emergence of sprouts may be expected where fertilizer is placed underneath or mixed with the soil in direct contact with the seed. On the other hand, when fertilizer was placed in bands each side of the seed piece early growth stimulation resulted in a more rapid emergence of sprouts. "By avoiding a method of fertilizer distribution that tends to retard sprout emergence the grower will probably lessen the chances from *Rhizoctonia* injury, but by using side placement of fertilizer a combined advantage may be obtained resulting from the efficient use of the fertilizer applied coupled with early emergence."

Influence of commercial fertilizers on yields, grades, and net value of potatoes in Hood River Valley, Oregon, G. G. Brown (*Oregon Sta. Bul. 343* (*1936*), *pp. 29, figs. 2*).—The effects of commercial fertilizers varying in formula on yields and grades of potatoes and the effects of legume cover crops in the rotation on potato yields were studied, 1920–30, with the Netted Gem, Burbank, and Early Rose varieties grown on Parkdale loam in cooperative tests.

The heaviest yields of potatoes followed sweetclover, alfalfa, Hubam sweetclover, vetch, or alsike green manures, while lowest yields came after red clover.

Fertilizers carrying a single nutrient element failed to produce economical yield increases over unfertilized plats, whereas nitrogen-phosphorus fertilizers with or without potassium were more effective. Yield increases over unfertilized plats, following the use of about equal amounts of plant food per acre, were not influenced significantly by variation in the nitrogen and phosphorus content. *The greater tonnage of U. S. No. 1 potatoes from fertilized v. unfertilized plats was due to heavier yields rather than a major difference in respective grading percentages.* The highest average percentage of No. 1 grade was associated with a relatively wide or intermediate nitrogen: phosphorus ratio.

Whole seed (3 oz.) of Netted Gem decidedly outyielded cut (halves of 3-oz. tubers) seed on both fertilized and unfertilized plats.

In the nitrogen and phosphorus series, when the amounts of plant food applied were 113, 239, 377, and 507 lb. of plant food per acre there were obtained 256, 291, 366, and 322 sacks of Netted Gem potatoes, an increase of 68, 110, 171, and 165 sacks over the unfertilized plats and an increase per 100 lb. of plant food applied of 60, 46, 45, and 32 sacks per acre. The 377-lb. rate, equivalent to 575 lb. of ammonium sulfate and 1,523 lb. superphosphate, was most economical, costing $38.57, and the cost per sack of its yield increase did not exceed that from the 239-lb. rate. Net values per acre of increased yields for the 113-, 239-, and 377-lb. applications with potatoes at 75 ct. per sack were from $39.66 to $90.05. *The costs per sack of the increase with Netted Gems following alfalfa green manure, when an application of 63 lb. per acre of nitrogen and phosphorus was increased progressively by multiples of from 2 to 8*, varied as follows: 6.2 ct., 13, 11.2, 17.3, 17, 20, 22, and 25 ct.

Based on similar quantities of nitrogen-phosphorus plant food, fertilizers with additional potassium were less effective than nitrogen-phosphorus fertilizers only in small applications, were more effective in intermediate applications, and were similar to nitrogen or phosphorus alone in large applications. Equivalent quantities of nitrogen-phosphorus without potassium were much more effective than the total amount of plant food in a complete fertilizer on the basis of number of sacks increase per 100 lb. of nutrients used. The value of sulfur in nitrogen-phosphorus fertilizer combinations with or without potassium seemed to be established definitely. The value of potassium in sulfur-carrying fertilizers also was more positive than in nonsulfur fertilizers.

The effect of naphthalene on germination of paddy seed, C. Rajasekhara Mudaliar (*Madras Agr. Jour., 23 (1935), No. 6, pp. 223–231*).—Varying quantities of naphthalene did not affect the germinability of dry rice for 1 yr., but thereafter deterioration was evident. Varietal differences were apparent. Storage of rice varieties in gunny bags with naphthalene did not affect germination for 7 mo., but thereafter germination became prolonged. The growing embryo was not injured by naphthalene left with the seeds soaked in water before planting, but when seeds were subjected to naphthalene vapor after germination began the tender radicle and plumule were injured.

A preliminary report of varietal differences in rapidity of germination in rice, C. L. Pan (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 985–989*).—In germination tests made of 84 varieties of rice, the number of days required for germination differed with varieties. The rices pertaining to *Oryza sativa indica* germinated much faster on the average than those belonging to the *O. sativa japonica* group. Within the former group there was no significant association between time of maturity and rapidity of germination.

Comparative hardness of tasseled versus untasseled canes, C. E. Pemberton (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 4, pp. 315–317, fig. 1*).—By means of a special instrument, untasseled canes of nine sugarcane varieties were found to be harder than those which had arrowed. The stalks in any variety which sucker profusely after tasseling were not as soft as those of the same variety which suckered very weakly. The process of dying or disintegration after flowering becomes very greatly suspended in all parts of the stalks if side shoots are vigorous. The greater softness of the tasseled canes may explain the greater incidence of beetle borer infestation in some areas in Hawaii where certain varieties tassel very heavily.

Effect of age upon the absorption of mineral nutrients by sugar cane under field conditions, A. Ayres (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 871–886, figs. 10*).—The effect of age upon the percentage composition of the sugarcane plant and of the changing demands which the growing cane makes upon the soil for mineral nutrients was studied at the Hawaiian Sugar Planters' Experiment Station, 1933–34. The percentage compositions (mineral) of the leaves and of the stalk of the plant were influenced markedly by the plant's age, particularly during the early months of growth. Dry matter of dead cane leaves contains much lower concentrations of potassium and nitrogen than that of green leaves, this being attributed to the migration of these nutrients from the leaves back to the stalk before the leaves become physiologically inactive.

The plant was found to take up potassium and silicon to the greatest extent, while nitrogen and phosphorus were absorbed in relatively moderate quantities. Of the nutrients studied, calcium and magnesium were absorbed in least amount. The absorption rate of the several mineral nutrients varied with the plant's age, but not always in the same degree. For all elements studied, except silicon, it reached maximum values by the age of 3 mo., during which period about 10 percent of the first year's uptake of phosphorus and potassium and nearly 25 percent of nitrogen occurred. After the age of 6 mo. with nitrogen and after about 10 mo. with calcium, magnesium, and potassium, the absorption rates diminished, whereas uptake of silicon and phosphorus continued at essentially constant rates until the experiment ended at 14 mo. Potassium and nitrogen were absorbed less rapidly just after the acquirement of maximum quantities of these nutrients by the leaves. It appeared that absorption of nitrogen, potassium, and probably other nutrients by sugarcane is primarily a function of the age or stage of development of the plant and not of the growth rate.

Pronounced differences were found in the distribution of the elements between the components of the crop, being most marked in phosphorus and silicon.

The quantities of these nutrients in the stalk (at the final harvest) amounted to 60 and 15 percent, respectively, of the totals taken up. Examination of the distribution of potassium in the stalk suggested that as the meristematic tissues mature they lose potassium by upward migration.

The influence of superphosphate and light lime applications alone and in combination on the composition of sweet clover, H. E. Myers and W. H. Metzger (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 976–984*).—Under conditions prevailing in eastern Kansas, ordinary applications of superphosphate alone or with a light application of lime did not increase consistently the percentage of phosphorus in sweetclover for the Kansas Experiment Station. Neither did light lime applications increase the calcium percentage in the plants. The variation in composition of the sweetclover from untreated plats in the different counties exceeded the variation in composition resulting from treatments in any one county. Large response from application of phosphorus or calcium tended to be associated with a smaller percentage of the corresponding element in the plant, and little or no response appeared to be associated with increased percentages of these elements. Light lime applications showed a marked tendency to reduce the percentage of phosphorus and nitrogen in sweetclover. Superphosphate tended to produce a lower calcium percentage in the plant, but was less consistent on the nitrogen. Superphosphate plus lime was quite inconsistent in its influence on the percentage composition of all the elements considered. Effects of treatment tended to be greater and more consistent in the first-year crop than in the second.

Timothy selection for improvement in quality of hay, M. W. Evans and J. E. Ely (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 941–947*).—The growing habits of the leaves on plants of three strains of timothy and of the relation of their condition to hay quality was studied in 1935 by the U. S. Department of Agriculture, cooperating with the Ohio Experiment Station. In the plats of both the early and the late selection, the leaves remain green longer than in plats of ordinary timothy. The number of days for the upper five leaves to emerge, remain green, and become dry averaged for the early strain 53, medium, common ordinary timothy 51.5, and the late strain 58.8 days. As the season advanced, the color reading of the hay from samples of all strains showed a constant decrease in hue, indicating the degree of greenness in the grades of hay and in its protein content. These values, correlated with the number of green leaves on the stems, were generally higher for the late selection than for the early selection or ordinary timothy. See also an earlier note (E. S. R., 75, p. 623).

Registration of improved wheat varieties, X, J. A. Clark (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 1017, 1018*).—Varieties of wheat approved for registration (E. S. R., 74, p. 632) in 1936 included Ramona, derived from Hard Federation × Bunyip, and Erect, derived from Dicklow × Hard Federation. Records of performances and brief descriptions are given.

Wheat varieties in Washington in 1934, E. F. Gaines and E. G. Schafer (*Washington Sta. Bul. 338 (1936), pp. 24, figs. 3*).—The 1934 survey of wheat varieties (E. S. R., 66, p. 32), made in cooperation with the U. S. Department of Agriculture, indicated a normal ratio of about 60 percent winter wheat to 40 percent spring wheat, and that fewer varieties than formerly were being grown. Production percentages by classes included hard red spring Marquis 1 percent; hard red winter Turkey 21, Ridit 8.2, and Kanred 0.2; soft red winter Triplet 5.7, Red Russian 0.6, Jones Fife 0.4, and Hybrid 123 0.1; hard white Baart 19.9, Bluestem 1.8, and Hard Federation 0.1; soft white Federation 13.5, Fortyfold 3.1, and Thompson 0.7; and white club Albit 20.7, Hybrid 128 1.3, and Jenkin 0.2 percent. Red wheats comprised 37.2 percent and white wheats 61.8 percent of the total; hard wheats 52.3 percent and soft wheats 46.3 percent. The adapta-

tion of the six leading varieties are noted briefly and their distribution areas indicated on outline maps. Farmers evidently were concentrating increasingly on the tested and recommended superior varieties. Indications were that if the current trend continues the 30 varieties listed as grown in 1934 in a few years would be reduced to Turkey, Ridit, Baart, Albit, Hymar, and Federation.

Handbook of Canadian spring wheat varieties, L. H. Newman, J. G. C. Fraser, and A. G. O. Whiteside (*Canada Dept. Agr. Pub. 538 (1936), pp. 51, figs. 45*).—The origin, description and illustration, milling and baking qualities, status and distribution, together with a determinative key, are given for 37 varieties of spring wheat grown in Canada.

Studies on the refractive indices of expressed juice in wheat seedlings, K. Eriko (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 887–899*).—The refractive indices of expressed juice as a physicochemical character of wheat seedlings were determined on eight winter and six spring wheats at the Sakhalin (Karafuto, Japan) Central Experiment Station.

The refractive indices of the winter varieties exceeded those of the spring wheats on an average when the plants were exposed to low temperature conditions before measurement. In comparisons between three temperature cultures—20°–32°, 5°–10°, and 0°–5° C., respectively—the greater refractive index occurred with the lower temperature, indicating the great effect of environmental factors. The hardy varieties had greater refractive indices, in general, than the nonhardy sorts under hardened conditions. Greater refractive indices were always observed in the juice from unfrozen plants as compared with frozen plants. Within the limits of the experiment, an accurate correlation was not observed between the content of total solids in expressed juice estimated by the refractometer and the monosaccharide content in seedling tissues obtained by chemical analysis.

[**Seed investigations**] (*New York State Sta. Rpt. 1936, pp. 85, 86, 87*).—The quality of agricultural seeds sold in New York, as revealed by official tests, is described, with brief observations from studies of viability of fescue seed and seed wheat, a drill survey of winter wheat (E. S. R., 76, p. 330), and further studies of the physiology of seed germination.

[**Report of Canadian Seed Growers' Association, 1935–36**] (*Canad. Seed Growers' Assoc. Ann. Rpt. 1935–36, pp. [1]+110, figs. 13*).—A report of the activities of the association during 1935–36 and of its annual meeting July 9–11, 1936. Papers of interest to agronomists include The Origin and Development of the Canadian Seed Growers' Association, by L. H. Newman (pp. 46–59); The Work of the Canadian Seed Growers' Association: Its Objective and Plan of Operation, by R. Summerby (pp. 60–64); The Use of Registered Seed in the Scheme of Canadian Agriculture, by H. G. L. Strange (pp. 65–70); The Present Policy of Registration of the Several Groups of Crops (pp. 71–74) and The Value of Standard Seed Stocks in Root Seed Production (pp. 95–99), both by W. T. G. Wiener; The Use of Registered Seed, by W. J. W. Lennox (pp. 75–77); The Rudiments of Pollination and Fertilization of Farm Crops, by W. H. Wright (pp. 78–82); An Analysis of Some Varieties of Oats Grown in Nova Scotia, by K. Cox (pp. 83–89); and Root Seed Production, by L. C. Raymond (pp. 90–94).

The spurge nettle, R. T. Stewart, R. G. Reeves, and L. G. Jones (*Jour. Amer. Soc. Agron., 28 (1936), No. 11, pp. 907–913, figs. 4*).—Spurge nettle (*Jatropha texana*), under study at the Texas Experiment Station and characterized by an enormous root and relatively small aerial parts, normally grows on very poor sandy soils and seems to be affected little by drought and remains green when other plants wither and die. Preliminary experiments on its control by chemicals and smothering are reported.

HORTICULTURE

[**Horticultural investigations by the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1936, pp. 5, 6, 10, 11, 12, 13, 14*).—Among studies, the progress of which are discussed, are those dealing with the growing and harvesting of pyrethrum and *Cracca virginiana*; the composition of hops as related to maturity and environment; the breeding of hops resistant to mildew; the breeding of peaches and grapes; development of nematode-resistant grape stocks; the irrigation of lemons; propagation, pruning, and tree thinning of pecans; the breeding of almonds, lettuce, beans, tomatoes, and muskmelons; rootstocks for roses; and the testing of rubber-producing plants such as *Asclepias*.

[**Horticultural studies by the Arkansas Station**] (*Arkansas Sta. Bul. 337 (1936), pp. 50–53, 54–58*).—Included are brief notes on the comparative rate of pollen tube growth in selfed and crossed apple flowers, effects of pistil and ovary extracts on the growth of pollen tubes, and factors causing sterility in the Stayman Winesap apple, all by J. R. Cooper; growth and fruiting of the tomato, by V. M. Watts; fertilizers for the peach, by Cooper; and for vegetables, by Cooper and Watts; effect of soil conditions such as texture and reaction and of plant vigor on the composition and character of strawberry fruits, and effect of fertilizer ingredients on the growth of the strawberry, both by Cooper; effect of soil acidity on production of vegetables, by Watts and Cooper; pruning of apples, by Cooper; breeding of tomatoes for disease resistance, and variety testing of peas, both by Watts; factors influencing the uneven ripening of grapes, effect of rootstock on growth and fruiting of American grapes, and testing of new fruits, all by J. E. Vaile.

[**Horticultural studies by the Delaware Station**] (*Delaware Sta. Bul 203 (1936), pp. 35–37*).—Information is given relative to the following studies: The relation of curculio injury to the premature dropping of apples and peaches, by L. R. Detjen and L. H. Strubinger; and normal variation in growth of apple trees upon own and seedling roots, by F. S. Lagassé.

[**Horticultural investigations by the Michigan Station**] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 22, 39, 40, 42, 43*).—Among studies, the progress of which is briefly noted, are those dealing with protective coatings for nursery stock, fruits, and vegetables; calcium cyanamide as an orchard fertilizer; sod culture for sour cherries; characteristics of good orchard soils and sites; and the breeding of new greenhouse tomatoes.

[**Horticultural investigations by the Missouri Station**] (*Missouri Sta. Bul. 370 (1936), pp. 63–67, 68, 69*).—Information is presented on studies relating to the effect of length of day upon reproduction in horticultural plants, and upon apple pollination, both by A. E. Murneek; a comparison of cyanamide, sulfate of ammonia, and nitrate of soda as fertilizers for apple trees, by Murneek and G. E. Smith; unbalanced fertilization of fruit trees, by Murneek and E. J. Gildehaus; the use of fertilizers on strawberries, by Murneek and J. H. Long; the nutritional requirements of the grape, by H. G. Swartwout; varieties of watermelons, by R. A. Schroeder; stimulation of lateral buds on plants, by C. G. Vinson and F. Horsfall, Jr.; yellows-resistant cabbage varieties, by Swartwout and Schroeder; and wilt-resistant tomato varieties, and fruit setting in midwinter tomatoes, both by Schroeder.

[**Vegetable crop investigations by the New York State Station**] (*New York State Sta. Rpt. 1936, pp. 38, 88–92*).—Included in this progress report is information on the following studies: Effect of time of fruit set and harvest on pumpkins and squashes; placement of fertilizer for peas, beans, tomatoes,

and cabbage; residual effect of fertilizer on subsequent crop of peas; comparison of different kinds of fertilizer; fertilization of spinach; breeding of squash, muskmelons, and tomatoes; and varietal description and classification of vegetables.

Vegetable fertilizers in Arizona, M. F. Wharton (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 552–554*).—Experiments conducted by the Arizona Experiment Station on an irrigated soil at Mesa which is characterized by high nitrates, high potassium, and low phosphates showed definitely the need of applying nitrogen and phosphorus. The need for N was explained by the fact that under irrigation nitrates moved up and out of the root zone by capillary movement and evaporation. Deep-rooted crops, such as carrots, turnips, and beets, obtain a sufficient supply of N from the soil. In the case of head lettuce, there was found a well defined correlation between mature head weight and the phosphate content of the soil. Where available phosphate was greater than 10 p. p. m. there was little response to applications. The use of slowly available sources of N promoted desirable color and texture in lettuce.

Nitrate requirements of truck crops on newly cleared land, L. M. Ware (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 555–559*).—Observing that despite liberal applications of phosphorus crop yields were extremely low on freshly cleared land at the Gulf Coast Substation, Fairhope, unless excessively large amounts of quickly available nitrogen were applied, greenhouse and laboratory studies were conducted by the Alabama Experiment Station to determine the causes. Much larger yields were obtained in the second year from non- and low-nitrogen treatments, and this improvement was even evident with late-maturing and late-season crops in the first year. Nitrate determinations of the soil of the nonnitrogen unplanted plats showed in the first season a complete disappearance after the first 2 weeks with a reappearance in very small amounts about 4 weeks later. Under the same conditions in the second year nitrates increased steadily for 3 mo., reaching an amount five times the original. The author suggests the probability that there is a "tieing up" of soil nitrates in fresh soil by bacteria the growth of which is encouraged by the large amount of organic matter present. Applications of nitrate in amounts sufficient to supply both the bacteria and the crop permit the successful cropping of freshly cleared soils.

Experiences with rapid chemical tests for the determination of nutrient deficiencies in vegetable crops, R. L. Carolus (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 579–583*).—Stating that fairly successful results have been secured by the Virginia Truck Experiment Station by testing the extracted sap of the stem and petiole of 19 crop plants for nitrate nitrogen, phosphate phosphorus, magnesia, potassium, and, to a lesser extent, for calcium oxide and ammonia, the author presents the results of tests for nitrate nitrogen, phosphate phosphorus, potassium oxide, and magnesium oxide conducted with collards, black cowpeas, and tomatoes grown in the greenhouse on four soils known to be deficient in N, P, K, and Mg, respectively. The plants in the N-deficient soil were extremely high in phosphate P and high in K. Limiting the P supply resulted in a marked increment in nitrate N and a great decline in phosphate P. K deficiency resulted in a low K content and a slightly higher nitrate content. Mg deficiency resulted in low magnesia, rather low nitrate, and low phosphate P, and usually an increased K content.

Analyses of cabbage grown in the open showed a correlation between the magnesia content of the soil and that of the plants. Rapid chemical tests showed a correlation between low K content in rhubarb petioles and the browning of the leaf edges. Manganese deficiency of the soil was exhibited in lowered con-

tent in the plant. In the case of sweetpotatoes, applications of N fertilizer had little effect on the total N in the tissues of the stems but did increase the nitrate N in the sap. The value and limitations of the rapid chemical method are discussed.

Effect of previous cold storage on the respiration of vegetables at higher temperatures, C. O. APPLEMAN and C. L. SMITH (*Jour. Agr. Res. [U. S.], 53 (1936), No. 8, pp. 557–580, figs. 15*).—Information is presented on the results of studies by the Maryland Experiment Station on the respiratory response of various vegetables and the dahlia placed at 22° C. following storage for various periods at 2.5°. The respiratory intensity varied greatly in the different species immediately after harvest. In the case of carrots, beets, and turnips, the respiration rate declined steadily until the end of the respiration period, while in the potato, sweetpotato, parsnip, onion, and dahlia respiration declined rapidly at first, then more slowly until it began to fluctuate around a fairly constant average rate for the remainder of the period. The effect of cold storage on the initial respiration rate at higher temperatures varied with the different species, being very pronounced in potatoes but not detectable in carrots. Vegetables with a relatively high percentage of starch and in which there was a rapid shifting of the carbohydrate equilibrium with temperature changes were the ones that showed the greatest increase in the initial respiratory rate when transferred from low to high temperature. There was no direct correlation between the content of either total or reducing sugars and the respiration rate in the vegetables studied. The authors state the sugar that accumulates in the starchy vegetables at low temperatures is not responsible for the initial respiration on transfer to warmer environments.

Loss of weight from celery during marketing as influenced by wrapping, trimming, temperature, and humidity, P. WORK (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 569–578, figs. 4*).—Experiments conducted by Cornell University upon the relationship of various factors, such as temperature, relative humidity, wrappers, and trimming of stalks, on the retention of weight and attractive appearance during the marketing period showed very clearly that low temperature and high relative humidity are essential to the good keeping of celery. Wrapping and trimming were especially important under open display conditions such as prevail in the ordinary market. Waxed paper retarded losses more than did parchment paper when the bunches were isolated and in the open. It was observed that the decline in salability fairly closely accompanied weight losses.

Nitrogen nutrition and chemical composition in relation to growth and fruiting of the cucumber plant, R. B. DEARBORN (*[New York] Cornell Sta. Mem. 192 (1936), pp. 26, pl. 1, figs. 2*).—Using a strain of White Spine cucumber which had been selfed and selected for nine generations at the University of Illinois, plants grown under high and low planes of nitrogen nutrition and treated differently with respect to defloration and fruit removal were observed as to growth and fruiting and the content of various nitrogen and carbohydrate materials.

Plants receiving a low supply of N grew more slowly and produced fewer and smaller fruits than did plants with abundant N. It was observed that in both the high and low N groups plants allowed to produce fruit had a higher rate of vegetative extension for a period of 10 to 14 days after pollination than did deflorated plants in the same groups. After the initial period of stimulation, the presence of growing fruits had a depressing effect on growth, particularly the vegetative portions. However, when the entire plant was considered, fruiting plants produced more green or dry weight than did deflorated plants,

indicating a higher rate of metabolic activity and a more rapid synthesis and storage of food.

From the compositional standpoint, high N plants in general had a higher percentage content of all forms of N than did comparable low N plants. Fruiting plants contained higher percentages of lipoid, residual, and total N and lower percentages of nitrate, amino, and amide N than did deflorated plants. Apparently in deflorated plants there was a less rapid absorption of nitrates and a more rapid rate of conversion in the formation of amino and amide N. The utilization of amino and amide N was apparently impeded in the absence of fruits.

Low N plants, in general, had higher percentages of carbohydrates than did high N plants, apparently because of the lower rate of utilization. Fruit bearing plants were found to have a lower percentage of carbohydrates than deflorated plants.

Summing up the studies, the author states that the results support the findings of Nightingale (E. S. R., 57, p. 216), but that there was no evidence that changes in composition are the cause of changes in growth habits. It is considered possible, on the other hand, that changes in the type of growth may initiate changes in chemical composition. Incidentally, plants with a high N supply produced more pistillate and fewer staminate flowers than did the low N plates. A relatively high level of N nutrition was necessary for the production of well shaped and well colored fruits.

Movement of salt (alkali) in lettuce beds under irrigation, M. F. Wharton and W. T. McGeorge (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 548–551, figs. 4*).—Analyses of samples of soil collected by the Arizona Experiment Station from an area on the experimental farm at Mesa, typical of that used for lettuce production, showed that during the culture of lettuce on raised beds under irrigation there is a considerable movement and accumulation of soluble salts, such as nitrates, chlorides, and sulfates of alkali and alkaline earth bases in the beds. The rate and amount of salt movement was correlated with bed type and quality and quantity of irrigation water. The greatest salt accumulation occurred in the center of convex beds. The subsoil beneath the beds had a higher salt content than the surface soil of the furrows. Potassium moved as other salts but more slowly. Phosphate movement was negligible.

Retarding effect of hardening on yield and earliness of tomatoes, A. M. Porter (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 542–544*).—Hardening of tomato plants for 10 days in a cold frame was found by the Connecticut State College to reduce the early yield of marketable fruits. Hardening increased the total yield for the entire growing season but not sufficiently to increase profitable returns over the nonhardened plants.

Storage losses in canning tomatoes, F. C. Gaylord and J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 545–547*).—Working in cooperation with commercial canning factories, the Indiana Experiment Station found that the loss in weight of tomatoes in the interim between harvesting and processing is proportional to the duration of the period held. Loss was greater in the sun than in the shade. The higher the grade the lower the weight loss. Storage resulted in an increase in culls, a decrease in No. 2, and usually a decrease in No. 1 fruits. With long periods of storage the detrimental effects were more marked in the sun than in the shade. With respect to yield and color of pulp, about 40 hr. of delay between picking and processing resulted in a significant loss in weight and decrease in quality and yield of pulp without any improvement in color.

Further studies on the occurrence of cracks in tomato fruits, W. A. Frazier (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 536–541, fig. 1*).—Continu-

ing investigations on the cracking of tomato fruits (E. S. R., 73, p. 475), it was noted that cracking was more severe on plants pruned to a single stem than on nonpruned plants. Removal of two-thirds of the leaves from the pruned plants resulted in a decided reduction in cracking as compared with pruned untreated plants. None of the three principal fertilizer elements, N, P, or K, even when applied liberally had any appreciable effect on cracking. The author suggests that the two types of cracking, namely, radial and concentric, may have different causes. Since leaf removal caused no appreciable difference in water content or carbohydrate composition, the author suggests the possibility that smaller size of fruit on the defoliated plants may have been a factor.

Fruit varieties for Missouri, T. J. Talbert (*Missouri Sta. Bul. 371 (1936), pp. 56*).—In connection with lists of desirable tree and bush fruits for commercial and home planting, the author presents information on the origin of new varieties by seed and by mutation, pollination requirements, soil preferences, and general trends in the improvement of existing varieties.

[Pomological investigations by the New York State Station] (*New York State Sta. Rpt. 1936, pp. 63–84*).—Progress statements are presented upon studies dealing with varieties of fruits; breeding of fruits, particularly the pear, cherry, peach, apple, grape, and raspberry; orchard management; winter injury to fruit trees; nutritional requirements of orchard and small fruits; orchard cover crops; relation of the nutritional status of the tree to disease and spray reactions; propagation of the quince; the adaptability of the Malling rootstocks; top working young apple trees; rootstocks for cherries and plums; stock and scion relationships to winter injury; handling of dormant nursery stock; germination of fruit seeds; value of *Pyrus betulaefolia* as a stock for pears; artificial culture of fruit tree embryos; vascular anatomy of the apple; fruit development as influenced by killing the embryo; fertilization, pruning, and breeding of grapes; taxonomy and breeding of cucurbits; metaxenia in the apple; chromosomal structure in the apple and grape; viability of fruit pollen; and variety and cultural trials with hops.

Root systems of some apple clons, F. B. Lincoln (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 323–328, figs. 5*).—Photographic reproductions are presented of the root systems of the following 3-year-old self-rooted apple trees produced at the University of Maryland by trench layering: King, Talman, Baldwin, Northern Spy, Jonathan, Henry Clay, Red Rome, Potter, Delicious, Gano, Duchess, Red Gravenstein, Hume, Early McIntosh, McIntosh, Keetosh, Crimson Beauty, Ferry, Stayman, and York Imperial.

Growth study of the apricot fruit [I], II, O. Lilleland (*Amer. Soc. Hort. Sci. Proc., 27 (1930), pp. 237–245, figs. 2; 32 (1935), pp. 269–279, figs. 7*).—Measurements at the California Experiment Station, Davis, of the developing fruits of the Royal apricot, led to the following deductions in part 1:

Whether measured on a fresh- or dry-weight basis, the flesh, endocarp, and kernel do not develop simultaneously. On a green-weight basis, the kernel and endocarp make their major increase relatively early, while the flesh makes its increase considerably later. With reference to total solids, the endocarp makes very little gain during the first month, increases rapidly during the second month, and shows no gain in the last month. On the other hand, the kernels make little gain in total solids during the first two months but thereafter continue to gain until harvest. The flesh makes its greatest increment in dry matter during the final month of development of the fruit.

Continuing the study, the author found again three well-defined periods of growth in the apricot fruit. To determine the effect of temperature on periodicity, a limb of a Blenheim apricot tree was enclosed in a celloglass structure in which supplemental heat was supplied at night with electric plates. The

acceleration of growth during the early season in the heated shelter was striking, abbreviating the first growth period by about 22 days. No reduction occurred in the length of the second period in the shelter. The results suggest that the theory set forth by other investigators that growth processes elsewhere in the tree may control periodic development of the fruit is untenable. Fruit in the heated chamber exhibited periodicity but distinctly nonsynchronous with unprotected fruit of the same tree. It is considered likely that temperature influences are the determinants which produce synchronism in growth. Shoot growth in the shelter was also advanced by the higher night temperatures. The period of maximum shoot extension was not coincident with the period of minimum fruit enlargement, suggesting no dominance of vegetative growth over fruit enlargement. While the development of the various constituents was advanced in the fruits under shelter, the same orderly sequence was maintained as in the outside fruits. Heat units and base temperatures are calculated for the various periods of growth in the Blenheim apricot.

Observations on fruit setting in the cherry in 1936, J. C. Kremer (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 94–96*).—Poor setting of the Montmorency and other sour cherries in the summer of 1936 was found to be associated with unfavorable weather conditions during the pollination period. In southern Michigan, abnormally high temperatures rushed the flowers through their development and nectar flow was limited by the low humidity. In northern Michigan, flowers opened after the hot period but the temperature was so low as to depress nectar secretion and bee flight. Observations show that where abundant strong colonies of bees were present there were better than average sets of cherries. Nectar secretion took place largely in the temperature range from 65° to 75° F. The sweet cherry, blooming earlier than the sour, encountered more favorable pollination weather.

Influence of irrigation upon important small fruits, W. S. Brown (*Oregon Sta. Bul. 347 (1936), pp. 37, figs. 9*).—Presenting the results of a 10-yr. study on the irrigation of small fruits, the Ettersburg 121 strawberry failed to respond to irrigation and showed a loss in both yield and net income. Irrigation resulted in average gains in the yield of the Evergreen blackberry, loganberries, strawberries, red raspberries, and black raspberries of 36.3, 58.4, 91.5, 58.4, and 110.5 percent, respectively. Results with black and red raspberries were also discussed in an earlier bulletin (E. S. R., 65, p. 740).

In the case of the Evergreen blackberry, both the acid and sugar content of the nonirrigated berries were slightly higher than in irrigated fruits but the differences were not sufficient to be noticeable to the taste. Analyses of loganberries showed no significant differences in acid or sugar content that could be attributed to irrigation. Strawberry irrigation resulted in no noticeable changes in acid content, but in the Marshall and Corvallis varieties sugar was slightly greater in the nonirrigated berries and the reverse was true in the Narcissa strawberry.

Drip tests of Evergreen blackberries showed no material difference in the holding-up qualities due to irrigation. In loganberries, there was a slightly higher percentage of solids in the irrigated fruits but the difference was not enough to affect the appearance of the canned product. In strawberries, drip tests showed no material difference in the solids that could be related to irrigation. In the three fruits, Evergreen blackberry, loganberry, and strawberry, irrigation resulted in a more attractive fresh fruit, that is, brighter in color and firmer in appearance.

The economic results of irrigation were directly related to price per pound in the Evergreen blackberry. The highest net profit was obtained in 1930 when heavy yields were coupled with good prices. In 1932, with very low prices

and heavy yields, the net losses were large. In the loganberry, type of pruning proved an important factor in economic results. Under irrigation full length canes yielded a substantially larger gross income than did short pruned canes. All strawberries except Ettersburg 121 showed a profit from irrigation for each year. Black raspberries, on the average, failed to be profitable with or without irrigation. Red raspberries returned a substantial profit from irrigation in years of good prices.

Inheritance in blackberries, T. E. ODLAND and A. E. STENE (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 423–426*).—In this preliminary report on an investigation at the Rhode Island Experiment Station designed primarily to study the inheritance of thorniness and habits of growth, the authors state that the Mayes Thornless and Santa Rosa were the only thornless varieties found and that these two are to be used largely in the breeding work. The best method of germinating blackberry seed was to store for 3 mo. at 33°–35° F. and sow in late September. Tabulated data are presented on the results of cross- and self-pollinations through 1935. The results suggest that thornlessness is heritable, and in one cross it appeared dominant. Trailing habit of growth was apparently dominant over upright.

The inheritance of suckering and tip layering in purple raspberry seedlings, A. S. COLBY (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 427–429*).—Observations at the Illinois Experiment Station on five groups of purple raspberries, derived by crossing Quillen with Golden Queen, Latham, June, Starlight, and Ranere, showed one group, namely, Quillen × Ranere, to fail to propagate by both suckers and tip layers. Quillen is believed homozygous for tip layering because no suckering was found in 579 seedlings obtained by self-pollination. Since about 25 percent of the plants of the Golden Queen, Latham, and Starlight crosses suckered, the possibility is suggested of a simple monohybrid character. Quillen × June yielded only 7 percent suckering plants. The absence of suckers in the Quillen × Ranere group suggests that absence is apparently dominant over presence of suckers. Suckering has the advantage that a greater number of plants can be propagated in a brief period.

The moisture content of strawberries as influenced by growing conditions, G. M. DARROW and G. F. WALDO (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 393–396*).—Records taken by the U. S. Department of Agriculture over a 3-yr. period on the dry weight of the fruits of many different varieties of strawberries grown without irrigation showed a range between a minimum of 4.9 percent in the first picking of the seedling U. S. D. A. No. 652 in 1929 to a maximum of 13 percent in 1929. The maximum was also recorded in the last harvest of Blakemore in 1930. Dry weight percentage in general increased with the advancing season in all 3 yr. The several varieties maintained their relative positions rather consistently during the 3 yr. In any variety large berries had a lower percentage of dry weight than did small berries. Heavy applications of nitrogen under conditions of ample but not excessive soil moisture appeared to result in lower dry weight.

Some effects of nitrogen fertilizer and irrigation on the growth and blossoming of the Howard 17 strawberry, E. W. GREVE (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 397–400*).—A total of 450 lb. of nitrate of soda was applied in equal applications on June 5, July 12, and August 20 to Howard 17 strawberries set in the field on April 21. In addition, supplemental irrigation was provided to part of the fertilized area and to part of the nonnitrated controls. The runner plants were placed in a double row with two series on each side of the parent. Nitrogen had a depressing effect on the number of runners formed and also apparently on the number of leaves per plant. The plants receiving no nitrogen and no irrigation produced longer runners than

the nitrated plants. The fewer number of leaves on the nitrogen plats was reflected in the results of chemical analyses of plants collected in September and October, the data showing higher carbohydrate-nitrogen ratios in the no-nitrogen groups. The generally slight effects of irrigation in the experiment are believed due to the heavy rainfall during the latter part of the growing season.

Effects of late summer and fall applications of nitrogen on fruit production in the strawberry, R. A. Van Meter (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 401–404*).—Studies at the Massachusetts Experiment Station of the effects of nitrogen on the fertility of the Howard 17 strawberry showed in general little indication that summer and autumn nitrogen applications were either significantly beneficial or harmful under the conditions, which included ample phosphorus and potassium and a soil of natural medium fertility.

Bunch grapes in north Georgia, J. E. Bailey (*Georgia Sta. Circ. 112 (1937), pp. 4*).—In connection with general varietal, cultural, and pruning information, tabulated analyses are presented on total solids and titratable acidity in the juices of several varieties of northern or bunch grapes.

A giant macadamia nut, C. E. Pemberton (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 4, pp. 303–306, figs. 2*).—A brief account is presented of the discovery in northern Queensland, Australia, of a single tree of *Macadamia whelani* Bail., bearing very large edible nuts. The first importation of these nuts to Hawaii failed to germinate, due apparently to immaturity at the time of collection.

Culture of tung-oil trees in Louisiana, J. C. Miller and W. D. Kimbrough (*Louisiana Sta. Circ. 17 (1936), pp. 4*).—This contains general information on culture, propagation, harvesting, protection from pests, and utilization.

Some recommended bulbs, shrubs and trees for the Panhandle of Oklahoma, H. J. Thomson (*[Oklahoma] Panhandle Sta., Panhandle Bul. 61 (1936), pp. 3–12*).—Varieties and species of ornamentals that have proved desirable for planting in western Oklahoma are discussed, with brief cultural suggestions, notes on comparative hardiness, etc.

Farmstead shelterbelts (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1936, p. 7*).—The results are very briefly summarized of tests of various tree species under the trying conditions of the northern Great Plains.

Adding to the attractiveness and comfort of the ranch home (*Montana Sta. Rpt. 1935, pp. 48–52, fig. 1*).—General information is presented on the establishment of shelterbelts, winter protection of red raspberries, culture and maintenance of the vegetable garden, and temperature requirements for celery, cabbage, onions, and other crop plants.

FORESTRY

Research [by the Forest Service, 1936], F. A. Silcox (*U. S. Dept. Agr., Forest Serv. Rpt., 1936, pp. 45–57*).—Results are briefly noted from comparative studies of naturally sown and transplanted seedlings; screen protection of seeds against rodents; reproduction following clear cutting, and disturbance of the forest floor; selection types of cutting; stimulation of root production; reclamation of aspen areas; production of hybrid pines; budding, grafting, and breeding pines; fire resistance of individual species; conservation methods in naval stores production; cost-of-production range studies; range management; influence of growth conditions on wood quality; minimum sizes of trees economical to cut; chemical seasoning of wood; producing a wood plastic; pulp and paper problems; economic studies of timber management; influence of

forest cover on stream flow; and evaporation and transpiration on semidesert watersheds.

[Forestry studies by the Arkansas Station] (*Arkansas Sta. Bul. 337 (1936), pp. 58, 59*).—There are discussed briefly the results of the following studies, all conducted by L. M. Turner: Germination and seedling growth of various forest tree species, root development of *Pinus echinata* and *P. taeda*, water and nutrient requirements of *P. echinata* and *P. taeda*, and site indices determinations for forest species on various soil types.

[Forestry studies by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 37, 38*).—Brief reports are presented on the soil requirements and effects of release cuttings upon the growth of black spruce, on the germination of white pine seed, and on the economics of taxing forest land.

The forest influence on streamflow under divergent conditions, C. G. Bates (*Jour. Forestry, 34 (1936), No. 11, pp. 961–969*).—Comparing results of observations in hilly areas of southwestern Wisconsin and adjacent Minnesota with standards set up by the Wagon Wheel Gap streamflow experiments in Colorado (E. S. R., 59, p. 477), the author found that despite the considerable differences in climate and soil, forest and other vegetation conserved water about equally well in both regions, and that it is only when the soil is bared of vegetation that erosion becomes a serious factor. Soils covered by forest are capable of absorbing water in large amounts except when frozen or covered with ice. The forested areas of southwestern Wisconsin, by actual absorption of a part of the water released about April 1 by the melting snow, helped to reduce the volume of possible floods in the Mississippi Valley.

Five-year remeasurement of sample plots, A. B. Recknagel (*Jour. Forestry, 34 (1936), No. 11, pp. 994, 995*).—Measurements taken at the end of the first 5-yr. period on 20 permanent 0.25-acre circular sample plats established by Cornell University in 1931 in the Adirondacks forest area showed consistent gains in volume in all species except balsam, which suffered severe windfall losses in a July 1936 storm. In the softwood flat type the average yearly growth in cords per acre for spruce and balsam was 0.048 and 0.07, respectively. In the hardwood type the average yearly growth of spruce was 0.388 cord. In the balsam there was a net loss due to the windfall.

X-ray treatment of tree seeds, H. I. Baldwin (*Jour. Forestry, 34 (1936), No. 12, pp. 1069, 1070*).—Dry seeds of *Pinus strobus*, *P. silvestris*, *Picea rubra*, and *P. excelsa* exposed to approximately 100 kv for exactly 4 min. at a distance of 8 in. from an X-ray tube failed to germinate appreciably different from the controls. There was indicated a slight retarding effect on the initiation of germination.

A method of studying knot formation, A. Koehler (*Jour. Forestry, 34 (1936), No. 12, pp. 1062, 1063, figs. 2*).—A brief description is presented of a method of sawing open the stems of second-growth trees in such a manner that a longitudinal section of every knot, even those previously overgrown, is revealed. Studies of several different species showed the need of early pruning of the lateral branches in certain trees, particularly northern white pine.

Studies in the genus Fraxinus.—II, Data on the flowering and fruiting habits of three American species of ash—of possible economic importance in the production of rapid-growing forest trees, E. Anderson and C. M. Whelden, Jr. (*Jour. Heredity, 27 (1936), No. 12, pp. 473, 474*).—Stating that the habit of certain species to bear male and female flowers on separate trees permits the possible production of hybrid seed on an economic basis, the author presents data on the flowering and the fruiting habits of three American species and some information on pollen viability.

Sprout groups and their relation to the oak forests of Pennsylvania, A. C. McIntyre (*Jour. Forestry, 34 (1936), No. 12, pp. 1054–1058*).—During the progress of a growth and yield study of oak forests by the Pennsylvania Experiment Station, data were collected in 123 sample plats on the sprouting vigor and sprout retentive capacity of the five principal oak species occurring in Pennsylvania second-growth forests. In young second-growth forests over 25 percent of the total number of stems and their basal area was found in the sprout group. As the forests grew older the number and basal area of the stems making up the sprout group was found to decrease. More sprout groups were observed on poor than on good sites. The three terms single sprout, multiple sprout, and sprout group are defined.

The detailed structure of stem wood of the two Sequoias, J. N. Mitchell (*Jour. Forestry, 34 (1936), No. 11, pp. 988–993*).—Comparative anatomical studies of *Sequoia gigantea* and *S. sempervirens* failed to reveal any structural features that would serve to distinguish absolutely the two species. However, there were certain differences, the most reliable being the number of wood rays per unit area of tangential longitudinal section, *S. gigantea* on the average having 75 percent more rays than *S. sempervirens*.

Scars resulting from glaze on woody stems, H. J. Lutz (*Jour. Forestry, 34 (1936), No. 12, pp. 1038–1041, figs. 2*).—A study by the Yale School of Forestry of the causes of peculiar horizontal markings on the trunks of young hardwoods led to the conclusion that scar tissue developed following lesions made during sleet storms when the trees were bent by the weight of the ice and the effect of the strong winds. Stands openly exposed to west, northwest, and north winds appeared to suffer the most injury.

Log rules, taper tables, and volume tables for use in the South, F. J. Lemieux (*Jour. Forestry, 34 (1936), No. 11, pp. 970–974*).—The author presents and discusses the functioning of tables developed and adapted for use in southern forests and which, over a period of 16 yr. of appraisal work, have proved useful in various sections of the South.

DISEASES OF PLANTS

[Plant disease work by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1936, pp. 2, 3, 5, 8, 9, 10, 12, 13, 15, 17*).—Reports are given of work on rust and smut of wheat, stalk rots of corn, "white tip" of rice, covered smut of oats, and root rot of milo and darso, and selenium toxicity to plants; control of cotton root rot; *Helminthosporium setariae* on millet and *H. turcicum* on Sudan grass; deterioration of fire-killed Douglas fir, decay in young hardwoods, and elm disease research; control of pear scab; mushroom culture and sweet orange fruit scab; nematodes attacking plants and several insects; zinc applications to the soil for control of pecan rosette; a nonparasitic disease of sugar beets; and control of tobacco blue mold by greenhouse fumigation.

[Plant disease work by the Bureau of Entomology and Plant Quarantine, 1936] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1936, pp. 23–25, 37–46, 54–57*).—Reports are given of work on the control of phony peach and peach mosaic diseases; citrus canker eradication; Dutch elm disease eradication; white pine blister rust control, including the extension of the disease to northern California, protection of the western white pine area, new infection in the Lake States, the Northeastern States largely initially protected, *Ribes* eradication in the southern Appalachian region, nursery protection and cultivated black currant eradication, a summary of field operations, and the enforcement of the

quarantine; the black stem rust (wheat) quarantine enforcement; and barberry eradication.

The Plant Disease Reporter, November 15, December 1, and December 15, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 20, pp. 310–329, figs. 5; 21, pp. 330–339; 22, pp. 340–362, figs. 4*).—Among other items of current interest, these issues contain the following notes:

No. 20.—The relative prevalence of various ear rot fungi in the 1933, 1934, and 1935 corn crops, by P. E. Hoppe and J. R. Holbert; incidence of ear rots in the 1935 corn crop, by N. E. Stevens; persistence of *Ceratostomella ulmi* in stumps of eradicated Dutch elm diseased trees in New Jersey, by T. W. Graham; miscellaneous notes on the Dutch elm disease; progress of fruit tree disease eradication campaigns (phony peach and citrus canker); strawberry dwarf in Massachusetts, by O. C. Boyd; diseases of herbaceous ornamentals in New York in 1936; by P. P. Pirone; *Septoria obesa* leaf spot of chrysanthemum, by T. B. Post; and bean rust severe in eastern Virginia and potato late blight in eastern Virginia, both by H. T. Cook.

No. 21.—Plant diseases in western Washington, by G. A. Huber; losses due to leaf roll in a potato variety test and vegetable diseases in Massachusetts in 1936, both by O. C. Boyd; two reports on downy mildews (*Peronospora trifoliorum* on alfalfa in New Mexico and *P. effusa* on spinach in tidewater Virginia, reported, respectively, by I. H. Crowell and H. T. Cook); losses from freezing and drought injury in Arkansas in 1936, by V. H. Young; and winter injury to fruit crops in Western States (report for Montana by H. E. Morris and for Idaho by E. C. Blodgett).

No. 22.—A cotton wilt survey in the Georgia Coastal Plain area in 1936, by A. L. Smith and H. W. Rankin; cotton diseases in North Carolina during the season of 1936 and root rot on peanuts in North Carolina in 1936, both by L. Shaw; occurrence of bacterial wilt in fall plantings of potatoes and eggplants in Florida, by A. H. Eddins; tomato disease notes for Georgia for 1936 (including the seedling plant industry and diseases in fields grown for fruit), by J. H. Miller; apple diseases in Pennsylvania in 1936, by R. S. Kirby, G. L. Zundel, A. H. Bauer, and L. T. Denniston; apple diseases in North Carolina in 1936, by L. Shaw; and leaf rust on Scotch pine in New York, by D. S. Welch.

[Phytopathological studies by the Arkansas Station] (*Arkansas Sta. Bul. 337 (1936), pp. 60–64*).—Progress reports not previously noted are given on a genetical, physiological, and pathological study of the cotton plant, with special reference to cotton wilt (*Fusarium vasinfectum*), by V. H. Young and L. M. Humphrey; on rice seedling blights, by E. M. Cralley; and on rose diseases, by H. R. Rosen.

[Phytopathological studies by the Delaware Station] (*Delaware Sta. Bul. 203 (1936), pp. 37–41*).—Progress reports are given on studies relating to the dissemination of peach yellows and little peach, tomato foot rot control, and the chemical disinfection of sweetpotato seedbeds, all by T. F. Manns; and to bacterial spot of stone fruits, diseases of cucurbits (downy mildew and a *Fusarium* wilt), and a comparison of spray materials for apples, all by J. F. Adams.

[Phytopathological studies by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 20, 21, 41*).—Progress reports are given on physiological studies with virus-infected raspberries; the anthracnose of oak and sycamore; *Fusarium* yellows of celery; snapdragon rust; potato diseases (mainly *Rhizoctonia*); cereal diseases, including corn; virus diseases of peach; and materials for the control of apple scab.

[Phytopathological studies by the Missouri Station] (*Missouri Sta. Bul. 370 (1936), pp. 29–34, 67, 88–90*).—Progress reports are given of studies relat-

ing to the control of smuts on small grain, morphologic and physiologic studies of the genus *Phytophthora*, a nursery disease of sweet cherries (apparently due to *Bacterium pruni* [=*Phytomonas pruni*]), a bacterial leaf spot and canker of sweet cherries (unidentified), measles and target canker of apple trees, and identification work on plant diseases, all by C. M. Tucker; control of damping-off of seedlings, root rots of corn and other cereals, and *Fusarium* wilt of tomatoes, all by Tucker, C. G. Schmitt, and G. W. Bohn; and virus diseases of plants (including concentration of the virus), by C. G. Vinson.

[**Phytopathological studies by the New York State Station**] (*New York State Sta. Rpt. 1936, pp. 28–35, 86, 87*).—Progress reports are given of studies on scab (*Venturia inaequalis*) and cedar rust (*Gymnosporangium juniperi-virginianae*) control on apples in the Hudson Valley; the evaluation of different applications of lime-sulfur for apple scab in 1935; diseases of small fruits in western New York (raspberry mosaics and streak virus disease, and strawberry "mosaic"); diseases of canning crops (pea root rot, treating pea seed with red copper oxide-graphite, damping-off in greenhouses, defoliation of tomato plants, and fungicides for cucurbits); red copper oxide as a spray and dust fungicide; downy mildew on hops; plant disease investigations on Long Island (including the root knot nematode of potatoes, bacterial wilt of sweet corn, and potato seed treatment with yellow oxide of mercury); fungus associates of pea seed; and *Helminthosporium* spp. on barley seed.

Department of mycology, E. S. Salmon and W. M. Ware (*Jour. Southeast. Agr. Col., Wye, Kent, No. 37 (1936), pp. 15–28, figs. 2*).—This gives data on the advisory and educational work of the department and progress reports on spraying tests against apple scab and on investigations of the following diseases of hops: Downy mildew (*Pseudoperonospora humuli*), virus diseases (including one believed to be new and a disease called "fluffy-tip", which is also believed to be due to a virus), canker due to *Sclerotinia sclerotiorum* (apparently a new disease of hops), a rootstock disease associated with *Marasmius rotula*, and *Cladosporium* disease. Brief miscellaneous notes are also included.

A systematic study of plant diseases and pests, with a contribution illustrating the annual damage to agriculture done by them [trans. title], M. Greve (*Nord. Jordbrugsforsk., 1935, No. 4–7, pp. 62–68*).—This is a statistical summary, with discussion, of the annual losses due to various plant diseases and pests in Denmark as compared over the period 1925–31.

Fifty years in the annals of phytopathology [trans. title], E. Gram (*Nord. Jordbrugsforsk., 1935, No. 4–7, pp. 57–61*).—This is a brief review of Danish work and publications relative to plant diseases for the half century beginning in 1884.

The problem of specialization and variation in phytopathogenic fungi, E. C. Stakman (*Genetica ['s Gravenhage], 18 (1936), No. 3–4, pp. 372–389*).—This contribution from the University of Minnesota and the U. S. Department of Agriculture is a general summary and critique of the present status of physiological races (particularly of the rust and smut fungi), presented at the Sixth International Botanical Congress, Amsterdam, September 2, 1935. It includes some previously unpublished data from the university and a literature list of 40 titles.

Morphology and life history of some Ascomycetes, with special reference to the presence and function of spermatia, III, B. B. Higgins (*Amer. Jour. Bot., 23 (1936), No. 9, pp. 598–602, figs. 13*).—Continuing this series (E. S. R., 63, p. 144), this paper from the Georgia Experiment Station describes the morphology and life history of the fungus, previously known as *Cercospora liriodendri* E. and H., which causes an angular leaf spot of *Liriodendron tulipi-*

fera. In addition to the conidial stage, the fungus produces spermogonia and perithecia. "The perithecial stage appears to be identical with *Sphaeria* (*Depazea*) *tulipifera* Schw., and the fungus has been transferred to the genus *Mycosphaerella* as *M. tulipiferae* (Schw.) n. comb."

"The development of both spermogonia and perithecia is initiated during the fall. The spermogonia mature and usually cease producing spermatia by the end of December, while the perithecia do not mature until the following spring.

"Evidence is presented indicating that the spermatia function as male sexual elements in the development of the perithecia."

Studies on Bacterium tumefaciens in culture media, M. LEVINE (*Amer. Jour. Bot.*, 23 (1936), No. 3, pp. 191–198, figs. 18).—Daily smears from the same culture showed morphological changes thought to be induced by the diminution in nutrients and the increase in katabolic products. The changes were not mutations, since these forms did not perpetuate themselves but appeared rather to be life-cycle phases. Irrespective of form, the organisms from old cultures transferred to fresh media always assumed the rod form characteristic of the "embryonic" stage of the species. Variations in the virulence of different cultures of the crown gall organism were noted. It is apparently capable of resisting the adverse conditions of drying and exposure to light, and in the young stages it withstood a temperature of 50° C. The sporelike bodies constantly seen in old, dry cultures are apparently an adaptive morphological change for resistance to these conditions.

Microscopic studies of Siegler's apple woolly knot organism indicated it to be unlike *B. tumefaciens* in cultural behavior. It has been shown that its pathogenic effects on stems of the common experimental plants are limited.

A contaminant, probably of the soil organisms frequently associated with *B. tumefaciens* in crown gall isolations, produces typical spores. While its tumor-inducing power leads to the conclusion that it may be slightly pathogenic, its relationship to *B. tumefaciens* is questioned.

Further studies on the relation of the curly top virus to plant tissues, C. W. BENNETT and K. ESAU (*Jour. Agr. Res.* [*U. S.*], 53 (1936), No. 8, pp. 595–620, figs. 10).—Continuing this cooperative study by the U. S. D. A. Bureau of Plant Industry and the University of California (E. S. R., 74, p. 355), it was found that the virus invades the phloem of the entire vascular systems of beet and tobacco. In susceptible beet varieties the disease is characterized by phloem necrosis and by phloem and pericycle hypertrophy and hyperplasia. The liquid content of the phloem moves through the intercellular spaces of the extraphloem tissue and accumulates on the surface of the petioles and leaves. In resistant beets anatomical abnormalities are less extensive, and very little exudation from the phloem was observed. Phloem degeneration in diseased tobacco passes through stages similar to those observed in beet, except that the necrotic areas become cavities and are not filled by proliferation of adjacent cells. No phloem exudate was observed in the intercellular spaces outside the phloem, nor did exudate occur on the plant surface.

In resistant beets the virus content of the parenchyma of the crown and stalk and the ventral sides of the petioles was very low as compared with adjacent regions containing vascular bundles. Likewise, much less virus was obtained from wood and pith of tobacco than from bark or from tissue containing internal phloem. The virus content of immature beet seeds was very low, increasing as the seed developed to a very high concentration in the mature seed. It was most abundant in the vascular region of the seed, but may not be restricted to the phloem. No virus was recovered from the embryo. Seeds

heavily charged with virus germinated readily, and the developing embryos utilized the food stored in the perisperm without becoming infected. The virus was inactivated in dry seeds within 3 mo. Virus was recovered from the seeds, capsule wall, and placenta, and from all of the flower parts of tobacco. No virus was recovered from the pollen or from parts of the anther containing no vascular bundles.

The evidence is believed to support the concept that the virus is closely associated with the phloem of affected plants.

The parasitism of Penicillium rugulosum on Aspergillus niger [trans. title], A. G. ROMANKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 1 (1936), No. 3, pp. 137, 138*).—The author claims to have demonstrated true parasitism of *P. rugulosum* on *A. niger*.

The zoospores of Phytophthora nicotianae [trans. title], S. KRUPKO (*Acta Soc. Bot. Polon., 11 (1934), Sup., pp. 385–400, pl. 1; Fr. abs., pp. 399, 400*).—The author describes and illustrates the morphology, cytology, development, and germination of the zoospores of *P. nicotianae*.

Contributions on the biology of Pseudomonas tumefaciens [trans. title], K. SCHILBERSZKY (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 3, pp. 146–159, fig. 1*).—A brief but comprehensive review of work on crown gall from its discovery in 1853 is provided, including a listing of the synonymy of the pathogen and the host families, genera, and species. In discussing the biology of the pathogen, its polyphagous and heteromorphic attacks on many dicotyledons and the nature of the resistance of monocotyledons, especially of gymnosperms, are considered. The process and effects of migration within the host tissue are also discussed. Galls caused by this pathogen are divided into eight morphological types, one of which (on *Pelargonium*) is reported for the first time. The author's inoculation work with the *Pelargonium* gall has shown *Cineraria* and *Primula* to be immune.—(*Courtesy Biol. Abs.*)

The overwintering of Puccinia triticina and P. graminis in their uredioforms [trans. title], K. ASPERGER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 3, pp. 131–143, figs. 2*).—The author investigated the possibility of these wheat rusts overwintering in mycelial or spore stages in living or dead host tissue, *P. triticina* being used chiefly, though companion work was done with *P. graminis*. Study of natural conditions, supplemented by greenhouse and cold chamber experiments, agreed in showing that dormant mycelium is chiefly concerned in the overwintering of *P. triticina*, while *P. graminis* depends on the urediospores for its overwintering stage. It is shown that natural or artificial cold modifies the relationship of rust mycelium to host tissue, greatly prolonging latent, invisible infections when the fungus has little or no parasitic relationship to the host tissues, in contrast with the usual strictly parasitic habits of rust fungi.—(*Courtesy Biol. Abs.*)

A method for staining rust mycelium in woody tissues, W. G. HUTCHINSON (*Phytopathology, 26 (1936), No. 3, pp. 293, 294*).—E. Strasburger's orseilline BB-aniline blue staining procedure proved best adapted for routine examination of white pine for blister rust mycelium. The method is modified for use with freshly cut, unfixed sections. The mycelium stains violet to blue, suberized and lignified walls are red, parenchyma walls usually blue, and cytoplasm and nuclei red. Haustoria, penetrating tracheids and surrounded by lignified callosities, stain a deep red in contrast to the bluish mycelium outside the cell wall.

A method of demonstrating rust hyphae and haustoria in unsectioned leaf tissue, M. C. MCBRYDE (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 686–688, figs. 2*).—This contribution from the Virginia Experiment Station describes a technic in which infected leaf tissue is treated in saturated aqueous solu-

tion of chloral hydrate, stained in acid fuchsin, destained in chloral hydrate, dehydrated with alcohol, counterstained with strong picric acid in oil of wintergreen, cleared in the latter, and mounted in balsam, giving clear demonstration of bean rust hyphae and haustoria.

The occurrence of Sclerotium delphinii Welch in Kansas, D. J. OBEE (*Kans. Acad. Sci. Trans., 38 (1935), p. 105*).—This note reports the isolation and culture of *S. delphinii*, found parasitizing species of *Ajuga*, *Lysimachia*, and *Sedum* in a rock garden.

Studies in phanerogamic parasitism, with particular reference to Striga lutea Lour., I–III, A. R. SAUNDERS (*Union So. Africa Dept. Agr., Sci. Bul. 128 (1933), pp. 56, pls. 4, figs. 3*).—The following are included:

I. *The economic importance, distribution, life history, and parasitism of Striga lutea* (pp. 5–28).—Witchweed (*S. lutea*) is briefly described, and a list of its known hosts (all Gramineae) is given. The hosts exuded from their roots a substance which was necessary to the germination of the parasite, and this did not depend on the mineral nutrition of the hosts. Its action was on the cell contents of the witchweed. The absence of excessive moisture and a temperature of from 30° to 35° C. were optimum for the germination of the parasite, and there was a distinct chemotropic influence by the host roots on its developing radicle. Details of the host-parasite relations are given. Nonhosts and immune hosts may be penetrated up to a certain point, but successful parasitic relationship in them is never established. Resistance seems to be due to anatomical or protoplasmic factors, but not to the pH of the cell sap. The life cycle of the witchweed usually requires about 3 mo., but the maximum germinability is not attained until the seeds are at least 18 mo. old. Besides mineral substances, the parasite absorbs liberal amounts of assimilated food from the host and the transpiration rate of the latter is markedly reduced. A brief discussion is given of the development of parasitism in the genus *Striga*.

II. *Experiments on the control of the parasite in the field* (pp. 28–41).—Witchweed proved to be controllable by clean cultivation, but the quickest method was the planting of trap crops. Other useful methods were liberal fertilization, wide spacing, lister planting, and chlorates of sodium, magnesium, and calcium used as herbicides. Deep plowing, interplanting of cowpeas, crop rotation, and chemical treatment of the soil to destroy the seeds or seedlings proved to be of little or no advantage.

III. *The breeding of strains of sorghums and maize partially immune to witchweed* (pp. 42–54).—A number of strains of sorghum partially resistant to witchweed were found, tested on heavily infested soil, and improved by selection. Crosses were also made in an attempt to combine the resistance and the desired agronomic qualities, with promise of success.

A genetic study indicated that inheritance of resistance is very complex. Transgression appeared in all three crosses made, several segregates being much more susceptible than their susceptible parents. Susceptibility was apparently partially dominant in two crosses and resistance incompletely so in the third. Seed color and resistance segregated independently in the F_2. There was no correlation in the F_2 between average plant height and resistance and between the yield and resistance, and in one case only was there a significant positive correlation between average plant height and yield.

Selection within self-fertilized lines of maize led to slightly increased resistance, but the results as a whole were not very encouraging.

On some species of Ustilago occurring on Erianthus and Saccharum, K. B. BOEDIJN (*Bul. Jard. Bot. Buitenzorg, 3. ser., 13 (1935), No. 3, pp. 484–486*).—The following species are listed and discussed as at present distinguish-

able: *U. eranthi*, *U. microthelis*, *U. pulverulenta*, *U. sacchari*, and *U. sacchari-ciliaris*.

The action of some aniline dyes on the development of Narcissus tazzetta and Phaseolus vulgaris [trans. title], B. Mancuso (*Riv. Biol., 19 (1935), No. 3, pp. 448–458, figs. 3*).—The stimulatory, indifferent, and toxic effects of various dyes (fuchsin, Congo red, neutral red, methyl blue, eosin, erythrosin, and malachite green) and dosages on *N. tazzetta* and *P. vulgaris* were tested and are discussed. All the dyes stained parts of the seed and seedlings, but fuchsin stained almost the whole plant.

The iron sulphate and lime-sulphur mixture as a spray, A. Kelsall (*Canad. Chem. and Metall., 19 (1935), No. 9, p. 239*).—This is an abstract of a paper presented before the Ontario Entomological Society, November 1934, and at the Maritime Chemical Association meeting, September 1935.

Studies on barley rust (Puccinia hordei) [trans. title], N. F. Buchwald (*Nord. Jordbrugsforsk., 1935, No. 4–7, pp. 69–77*).—A historical account of the nomenclature of *P. hordei* (=*P. anomala*) is given, followed by morphological comparisons of this species to the yellow rust fungus (*P. glumarum*), with special reference to the teliospores.

Observations on seed treatment of cereals: The toxicity of precipitated sulfur for covered smut of barley [trans. title], A. Petit (*Rev. Path. Vég. et Ent. Agr. France, 22 (1935), No. 1, pp. 57–59*).—Precipitated sulfur is reported as effective for seed treatment of barley against covered smut (*Ustilago hordei*), though it has no action on *Tilletia*. The comparative fungicidal values of sulfur and various copper preparations against species of *Ustilago* and *Tilletia* are discussed, together with the mechanisms of their action.

Studies on the control and other aspects of bunt of wheat, C. S. Holton and F. D. Heald (*Washington Sta. Bul. 339 (1936), pp. 35, figs. 2*).—Copper arsenite dust proved no more effective than copper carbonate dust in preventing bunt infection from the soil. Basic copper sulfate dust caused no seed injury to treated seed held for 1 yr., resulted in improved germination, and gave complete control in moderately smutty seed and only traces of bunt in heavily smutted seed in spring seedings of Federation and Marquis. Holding seed treated with copper carbonate for from 3 weeks to 9 mo. before planting did not materially affect the efficiency of control in spring plantings of Federation, but did lessen the protective value of Ceresan. Fall seedings with Hybrid 128 held for from 3 weeks to 3 mo. before planting were about equally protected, but failed of good control. Periodic seedings of heavily smutted Hybrid 128 showed decreasing effectiveness of treatments from early September to late October seedings. New Improved Ceresan at 0.5 oz. per bushel gave as good control as Ceresan at 2 oz. per bushel.

Copper carbonate did not always give equal protection with different bunt races, and poorer control followed with races of *Tilletia tritici* than with races of *T. laevis*.

Commercial washing of smutted wheat for milling purposes apparently makes it possible to clean heavily smutted grain for seed with sufficient effectiveness to use one of the standard dust disinfectants with reasonable safety.

Trench seeding as compared with normal drill seeding gave less smut in periodic plantings under natural field conditions, and in artificially contaminated soil it reduced the smut by at least one-half.

Marquis wheat obtained from different regions and uniformly smutted and planted at Pullman gave varying amounts of smut. Growing the strains there for 1 yr. made them somewhat more uniformly susceptible, while Pullman seed grown 1 yr. in other localities and returned to Pullman for seeding showed variations in the amount of smut developed.

Two new physiologic races of *T. tritici* for Washington are added to the list previously recognized. The separation of such races by criteria other than pathogenicity is discussed, and a new race of *T. tritici* is distinguished on morphological, germination, pathogenetic, and host-parasite relations. Data presented suggest that the growing of resistant varieties of wheat has tended to promote the increase and spread of new races of *T. tritici* and *T. laevis*. Variety tests have shown that the results obtained in different regions may differ, owing to the presence of different races of bunt. It is also shown that the use of composites of a large number of bunt races is not a reliable method for determining the absolute bunt resistance of a variety.

Indexes of real winter hardiness cannot be obtained from heavily smutted plantings, nor are plantings showing winter injury reliable for the determination of smut resistance.

Experimental infection of Petkus rye with wheat bunts (Tilletia tritici and T. laevis) [trans. title], R. NIEVES (*Bol. Min. Agr. [Argentina], 36 (1934), No. 4, pp. 347–359, fig. 1*).—During three years (1931–33), experimental infections with these wheat bunts were obtained on the Petkus variety of rye.

Phytopathological characteristics of the winter and spring wheat sorts in relation to smut and brand, G. A. FRIDRIKHSON (FRIDRICHSON) (*Sotsialist. Zern. Khoz. (Socialist. Grain Farming), 5 (1935), No. 5, pp. 77–81; Eng. abs., p. 81*).—The varieties of spring and winter wheats here discussed are reported to be considerably injured by smuts, which are worst on the winter varieties. Among the spring wheats there are some varieties which escape injury and which have little or no bunt. Except for the variety *erythrospermum* [*Triticum aestivum*], these are all hard wheats.

Experimental studies of Penicillium infection in wheat [*trans. title*], A. NOLL (*Phytopath. Ztschr., 9 (1936), No. 2, pp. 147–186, figs. 6*).—The paper includes a general discussion of the genus *Penicillium* and of the species found on wheat seed, the symptoms of infection, inoculation tests, the spread of the fungus within the plant, the factors influencing infection, and control measures. A literature list of 40 titles is included.

Spotted wilt disease of lettuce and potatoes, C. J. MAGEE (*Agr. Gaz. N. S. Wales, 47 (1936), No. 2, pp. 99, 100, 118, figs. 4*).—This virus disease, transmitted by *Thrips* spp., is stated to have been introduced into Victoria in 1915 and since to have spread to all the other Australian States. A brief general discussion, with control measures, is presented.

Inheritance of resistance to powdery mildew in beans, B. DUNDAS (*Hilgardia [California Sta.], 10 (1936), No. 8, pp. 241–253*).—The susceptibility of different varieties and individual plants of *Phaseolus vulgaris* to *Erysiphe polygoni* was determined by inoculating detached leaflets on cotton soaked in 10 percent sucrose solution, the results in most cases agreeing closely with field and greenhouse infections. Mildew readings were made on the scale of 0 to 4.

The varieties Hungarian, Lady Washington, Pinto, and Pink proved resistant, while Robust and Red Kidney were susceptible under all conditions tested. Frijole negros was resistant in the field and greenhouse but semiresistant in the Petri dishes. Long Roman was semiresistant in the field and greenhouse but susceptible in the dishes. Plants were often somewhat more resistant in the seedling stage than later.

"The F_1, F_2, and F_3 progenies of a cross between the semiresistant Long Roman and the resistant Pinto were similarly tested, and of the 47 resistant F_2 plants tested 16 proved to be homozygous and 31 heterozygous. Readings of 0 and *t* [trace] in the F_2 plants indicated homozygosity or heterozygosity for resistance; 1 and 2, heterozygosity only; and 3 and 4, homozygosity for sus-

ceptibility. In the crosses with Robust and Long Roman, the Pinto is seen to have a single Mendelian factor pair for resistance to the strain of powdery mildew used."

Snowmold injury to bent grasses, J. TYSON (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 87-92, figs. 7*).—On the basis of the 1935-36 results, the author discusses and copiously illustrates the relative susceptibility and resistance of various strains of bentgrass to snow mold injury, the decreasing resistance rating of the varieties used being Astoria Colonial, Washington, and Metropolitan creeping, Rhode Island and Prince Edward Island Colonial, German mixed, and Seaside creeping bentgrasses.

Injury on plats treated continuously with organic fertilizers, such as cottonseed meal, dried blood, or milorganite, was much more severe than on those treated with ammonium sulfate, urea, or sodium nitrate. Injury was least with calcium nitrate.

Good results were obtained with all mercury treatments used, their relative effectiveness depending on their mercury content. Best results followed mixing with dry soil and broadcasting without subsequent watering.

Principal diseases of cotton in Peru [trans. title], G. GARCIA RADA (*Min. Fomento, Dir. Agr. y Ganadería [Peru], Circ. 28 (1935), pp. 19, pls. 6, figs. 5*).—The cotton diseases included in this handbook are wilt (*Fusarium vasinfectum*), sore shin or damping-off (*Rhizoctonia* sp.), powdery mildew (*Erysiphe malachrae*, conidial stage *Ovulariopsis gossypii*), brown boll spot (*Helminthosporium gossypii*), and black leaf spot (*Alternaria tenuis*). All are illustrated by colored plates.

Note on the Diplodia of cotton [trans. title], N. AZEVEDO (*Rodriguésia, 1 (1935), No. 2, pp. 97, 98, fig. 1*).—This is a note on a *Diplodia* occurring on cotton bolls in Brazil, having the characteristics of *D. gossypina*.

A rating of plants with reference to their relative resistance or susceptibility to Phymatotrichum root rot, J. J. TAUBENHAUS and W. N. EZEKIEL (*Texas Sta. Bul. 527 (1936), pp. 52*).—The ratings given are based either on artificial inoculations in experimental fields or on field observations over a period of years. The 2,116 plants listed include the crop plants widely grown in root rot areas, native weeds, shrubs, and trees, and also some less common plants. The general basis for the ratings is the percentage of plants which develop symptoms of root rot when exposed to infection under favorable conditions, and the relative susceptibility is indicated by symbols. Table 1 summarizes the relative susceptibility or resistance by families, while table 2 gives similar data for the plant species arranged alphabetically by scientific names under their respective families. An alphabetical index gives a key to the lists through both the common and generic names of the plants included.

Chemical dust treatment of cottonseed for planting purposes, H. P. SMITH, D. L. JONES, D. T. KILLOUGH, and H. C. MCNAMARA (*Texas Sta. Bul. 531 (1936), pp. 24*).—At all locations used, when planted at optimum rates and dates, fuzzy cottonseed treated with Ceresan gave an increase both in number of seedlings and in yield. At Lubbock, the early planted Ceresan-treated fuzzy seed gave fewer seedlings and lower germination than the untreated seed but no significant differences in yield. Ceresan treatment of mechanically delinted seed planted at optimum rates and dates gave a larger number of seedlings emerging at four of the stations than no treatment. At Greenville, seedlings from seed treated with Ceresan or Bayer Dust 502 and delinted with HCl gas or H_2SO_4 had a smaller number of plants infected with angular leaf spot in the early seedling stage. Treating fuzzy seed with Bayer Dust over a 3-yr. period gave fewer seedlings but slightly higher yields than did untreated seed, while similar treatment of mechanically delinted seed gave more seedlings but slightly

lower yields. Treatment of fuzzy or mechanically delinted seed with copper carbonate was unsuccessful under Lubbock conditions.

When cotton was planted at Lubbock on four dates within the month beginning April 25, the total number of plants generally increased the later the date of planting. When untreated fuzzy seed was planted at the rates of 16, 20, 24, 28, and 32 lb. per acre at four stations, there was a general tendency for the stands at thinning time to be larger as the rate of planting increased. In most cases untreated seed planted in a 4-in. listed furrow averaged more plants than either surface planting or the 7-in. listed furrow at Lubbock. Thinning at Lubbock to a 12-in. spacing gave a higher yield than unthinned cotton for both treated and untreated fuzzy or delinted seed.

Biometrical study of the spores of Phlyctaena ? linicola [trans. title], L. A. Garassini (*Rev. Argentina Agron., 2 (1935), No. 7, pp. 245-249, fig. 1*).—The author presents statistical data on the spore measurements of this fungus as grown on various natural and artificial culture media, and concludes from this preliminary study that the fungus of flax pasmo should be transferred to *Septoria* or to some related genus.

Resistance of Nicotiana species to blue mould (Peronospora tabacina Adam), S. Smith-White, S. L. Macindoe, and W. T. Atkinson (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 1, pp. 26-29*).—Tests of varieties of *N. tabacum* and *N. rustica* indicated little of value for breeding for resistance, but high resistance was found in the Australian species. Some of the latter, and particularly *N. debneyi*, may prove valuable for breeding. It is suggested that their high resistance may be significant as indicating the possible origin of *P. tabacina*.

Paspalum ergot, R. B. Morwood (*Queensland Agr. Jour., 45 (1936), No. 2, pp. 146, 147, fig. 1*).—This is a general note on *Claviceps paspali* as it occurs on this popular pasture grass in Queensland.

Curly dwarf in Colorado, C. H. Metzger (*Amer. Potato Jour., 13 (1936), No. 11, pp. 316, 317*).—A serious disorder of Brown Beauty potatoes is described. The symptoms resemble those described by Orton (E. S. R., 30, p. 649) for curly dwarf. First observed on occasional plants in 1933, it was much more prevalent in 1935. Further studies by the Colorado State College were under way to determine whether it is a virosis, as is deemed probable.

Some observations on potato "degeneration" in South Africa, A. R. Pullen and J. Wassermann (*So. African Jour. Sci., 32 (1935), pp. 271-279, pl. 1*).—Potato deterioration in South Africa is common, but examination of potato fields in the Transvaal has shown that virus diseases may be far less prevalent than would be expected. Descriptions are given of abnormal forms suspected of virus origin, and some of them are said to agree closely in symptomatology with virus diseases described in other countries.

"The prevalence of what are locally called 'wild' potatoes in potato fields is commented on, and descriptions of two distinct types are given. They are considered to be true rogues and not systemic virus-diseased plants. They appear healthy, and one of them breeds true from seed harvested from berries. . . . The sorting out of seed-size tubers from the heap after harvesting without discrimination against the wild form insures the perpetuation of the latter at the expense of the true variety.

"It is suggested that good stocks of potato seed can be maintained in South Africa by careful selection of seed, followed by hill selection of healthy, normal plants. Fields used for planting should be clean, i. e., free from rogues."

Breeding for resistance to common scab in the potato, C. F. Clark, W. P. Raleigh, and F. J. Stevenson (*Amer. Potato Jour., 13 (1936), No. 9, pp. 256-259*).—The results are reported of tests begun in 1930 in cooperation with the

Maine Experiment Station to determine the resistance to [*Actinomyces scabies*] of some thirty-four European and American potato varieties, as well as many South American types, seedlings, and progenies from various crosses. Promising evidence of scab resistance (though never complete immunity) was met with in both russet and smooth-skinned types.

Fungi isolated from discolored rice kernels, E. C. Tullis (*U. S. Dept. Agr., Tech. Bul. 540 (1936), pp. 12, figs. 4*).—In studies in cooperation with the Arkansas, Louisiana, and Texas Experiment Stations, the discoloration of rice kernels seemed to be due to several fungus species, and 16 genera have been isolated from surface-sterilized kernels. The parasitic forms gain entrance through the glumes and attack the immature kernel, while the saprophytic forms may develop after the rice matures.

In descending order of relative frequency of occurrence, the fungi most commonly found are as follows: *Curvularia lunata*, *Fusarium* spp., *Trichoconis caudata*, *Helminthosporium oryzae*, *Phoma* spp., *Alternaria* spp., *Cladosporium herbarum*, *Nigrospora oryzae*, *Curvularia maculans*, *Epicoccum neglectum*, and *Helicoceras oryzae*.

Observations on the occurrence of Anguillulina dipsaci (Kühn, 1858) on rhubarb in Yorkshire, L. R. Johnson (*Jour. Helminthol., 14 (1936), No. 2, pp. 77–84, figs. 3*).—The history of the infestation in Yorkshire, where it is widespread and always intimately associated with crown rot, is reviewed.

In the present study, active eelworm infestation was always seen in advance of severe rotting, and all the data strongly suggested that it is of primary importance in the development of the decay. Factors influencing eelworm infestation in rhubarb are discussed, including soil type, cultural methods, disposal of debris, and rotations. Infection tests provided additional evidence to the field observations that the oat and rhubarb strains of *A. dipsaci* are reciprocally infective. From all data at hand, it appears safest to assume that, although bacteria alone can cause crown rot, in the field the incidence of the disease is increased very considerably by eelworm attack which is always present in advance of the bacterial rotting. With healthy rootstocks and lack of eelworm infestation in the field, the disease appears to be largely controlled.

The pH gradient extending from the phloem into the parenchyma of the sugar beet and its relation to the feeding behavior of Eutettix tenellus, J. M. Fife and V. L. Frampton (*Jour. Agr. Res. [U. S.], 53 (1936), No. 8, pp. 581–593, figs. 4*).—When treated before and during the inoculating period, the ratio of curly top infection in normal v. CO_2-treated seedlings was 4.7:1. Exposure of seedlings to high concentrations of CO_2 immediately after inoculation failed to reduce the percentage of infection. When the vector *E. tenellus* is forced to feed on the petioles of plants treated with CO_2 it apparently loses its sense of direction, so that reaching the phloem, from which it normally feeds, becomes a matter of chance. Of the feeding tests in the normal petioles, 56 percent terminated in the phloem, whereas only 12 percent of the tests in the CO_2-treated petioles terminated there. The ratio was 4.6:1. The striking agreement between these two ratios is further evidence that the virus must be deposited in the phloem to induce infection.

A microquinhydrone electrode was built in such a way that the pH of the individual parenchyma cells could be measured without disturbing adjoining cells. A gradual pH gradient from the phloem into the parenchyma was found in the normal sugar beet petioles. By exposing them to high concentrations of CO_2 the normal pH gradient was entirely upset and even reversed. The pH gradient in the CO_2-treated petioles returned to normal when placed under atmospheric conditions. The evidence thus indicates that the leafhoppers, while feeding under normal conditions, are guided to the phloem by the pH gradient.

Comparison of derivatives from distinctive strains of tobacco-mosaic virus, F. O. Holmes (*Phytopathology, 26 (1936), No. 9, pp. 896–904, fig. 1*).—"Yellow-mosaic strains derived from the masked strain of tobacco-mosaic virus, although not confined to primary lesions, were found characteristically to lack the high degree of invasiveness possessed by many yellow-mosaic strains derived directly from the distorting strain of tobacco-mosaic virus. The uninvasive character that was obtained at the time of isolation of the masked strain was thus retained in the systemic yellow-type derivatives of this strain. Changes to yellow-mosaic type and to invasive type appear to be independent and may represent unit differences in the structure of the virus similar to unit differences in genetic structures of plants and animals."

Possible relationship of Stanley's crystalline tobacco-mosaic-virus material to intracellular inclusions present in virus infected cells, H. P. Beale (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, p. 333*).—This is an abstract of a paper presented before The American Phytopathological Society, December 29, 1936, in which studies were described showing that under the influence of HCl crystalline plates in the cells of six different host plants affected with Johnson's tobacco virus 1 or 6 disintegrated into needle crystals indistinguishable from those formed by acidification of the virus extract purified according to the Stanley method (E. S. R., 73, p. 800).

Inactivation of tobacco mosaic virus by ascorbic acid, M. Lojkin (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, p. 335*).—This is an abstract of a paper presented before The American Phytopathological Society, December 29, 1936, describing studies in which the reduced form of ascorbic acid as dilute as 0.03 mg per cubic centimeter completely inactivated purified tobacco-mosaic virus in the presence of atmospheric oxygen.

Inactivation of the virus of common tobacco mosaic by drying and by freezing in soil, S. G. Lehman (*Jour. Elisha Mitchell Sci. Soc., 52 (1936), No. 2, p. 159*).—An abstract.

***Carbolineum emulsions for orchard trees.*—I, The stability and dispersion of carbolineum emulsions** [trans. title], F. Beran (*Anz. Schädlingsk., 12 (1936), No. 2, pp. 17–22, figs. 2*).—This study indicated that the stability of carbolineum emulsions in containers is no criterion of their permanence as emulsion films.

Chlorosis of fruit plants and methods for controlling it, S. F. V'ünov (Vyünoff) (*Nauch. Plodovod. [Michurinsk], No. 6 (1935), pp. 12–32; Eng. abs., pp. 31, 32*).—Insufficient absorption of iron by the roots is given as the main, direct cause of chlorosis on carbonate soils, one of the indirect causes being calcium carbonate in the precipitated form. The physiological activity of the roots also has its influence, acid excretions aiding in the absorption of iron. Palliative control methods are recommended, including iron or sulfur applications, breeding of chlorosis-resistant stock, and avoidance of the type of carbonate soils favoring chlorosis.

Fire blight: Overwintering, dissemination, and control of the pathogene, K. G. Parker (*[New York] Cornell Sta. Mem. 193 (1936), pp. 42, figs. 5*).—Fire blight ooze infecting the first spring blossoms may originate from overwintering cankers on twigs, but this does not appear to be very common in the average New York season. Blight infections usually can be traced to larger overwintering cankers within the orchard. Dissemination of primary inoculum to the blossoms may be effected by splashing rain, if the source is in the upper part of the tree. Insect transmission is well known, and experimental evidence is presented incriminating species of flies and ants. Evaluation of the relative importance of rain and insects is not attempted on the evidence available. Dissemination of secondary inoculum to blossoms may be effected to a small

extent by meteoric water, though blossom-visiting insects are probably more important in transmission from blossom to blossom. Inoculation of growing shoots and leaves may be primary or secondary. Sucking insects seem to be relatively important in infecting terminals, but rain may be a factor here also. Leaves are inoculated by both insects and rain.

Bacteria antagonistic to *Erwinia amylovora* [=*Bacillus amylovorus*] in culture have been found which will to some extent prevent blossom infection, or even inhibit an infection already started.

Zinc chloride solutions of sufficient concentration to disinfect the cankers killed more of the living bark than was desirable, but cadmium sulfate solutions possessed considerable efficiency in disinfecting them without serious injury to the sound tissues.

A disease of pear trees due to a basidiomycete [trans. title], G. Goidànich (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 4, pp. 501–532, figs. 13*).—This disease, shown to be due to *Stereum purpureum*, is described as to both internal and external symptoms, and the morphology and behavior of the fungus (on media and on the host) and the host-parasite relations are detailed. Control measures are suggested.

Symptomatic and etiologic relations of the canker and the blossom blast of Pyrus and the bacterial canker of Prunus, E. E. Wilson (*Hilgardia [California Sta.], 10 (1936), No. 8, pp. 213–240, figs. 6*).—The main object of this study was to determine the relationships between a canker and blossom blast of pear and the bacterial canker of stone-fruit trees. The results indicated that the limb canker and blossom blast of pear are phases of the same disease, which also attacks dormant buds, twigs, and fruits. The pear and stone-fruit diseases showed similarities as to the parts attacked, the character of the symptoms, and the season of activity, and the bacteria from the two hosts were identical in the inoculation and cultural tests.

Besides the two strains of stone-fruit bacteria (*Phytomonas* [=*Bacterium*] *cerasi* and *P. cerasi prunicola*) and those from pear limb cankers and blossom blast, the pathogenicity and cultural studies included also *P. utiformica*, *P. papulans*, *P. citriputeale*, cultures isolated by H. R. Rosen from pear blossom in Arkansas, and cultures isolated by the author from apple in California. These inoculation and cultural studies supported the belief that *P. utiformica*, *P. citriputeale*, and Rosen's bacterium are identical with the stone-fruit organism, while *P. papulans* proved to be an unrelated species. Except for the last, the author believes that these organisms should be given the same species name and that the preponderance of evidence from the literature points toward *P. syringae* as the correct binomial.

Erwinia amylovora [=*Bacillus amylovorus*] was differentiated from the canker organisms described.

Green rotting of apricot fruits and dying back of apricot branches caused by Sclerotinia sclerotiorum [trans. title], S. J. du Plessis (*So. African Jour. Sci., 32 (1935), pp. 238–245, figs. 5*).—*S. sclerotiorum* was isolated from affected material in the Stellenbosch region of South Africa, and the symptoms and histopathology of the disease are discussed. A *Botrytis* sp., associated with the green rotted fruits, proved to be a saprophyte or at most a secondary parasite.

Peach mosaic not cured by heat treatments, L. O. Kunkel (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 683–686, fig. 1*).—Experiments were conducted with peach material from Colorado affected by a form of mosaic, the symptoms of which, as developed in young trees in the greenhouse, are described. Transmission by juice inoculations failed, by budding succeeded. Hot-room treatments effective in curing peach trees of yellows, rosette, little peach, and red

suture failed to inactivate this mosaic virus. In bud sticks it was not inactivated at 35°, 42°, or 50° C. for periods of time nearly as long as the limit at which peach tissues could remain alive. It seemed doubtful that heat treatments would prove effective in dealing with this mosaic, which does not appear closely related to the other viruses mentioned.

Copper sulfate and lime-sulfur [trans. title], A. Pieri (*Note Fruttic., 14 (1936), No. 1, pp. 3–7*).—This note discusses the comparative merits of these salts in fungicidal sprays against *Exoascus* infection of peach trees.

The Cercospora species parasitizing grape leaves in Palestine [trans. title], T. Savulescu and T. Rayss (*Rev. Path. Vég. et Ent. Agr. France, 22 (1935), No. 3, pp. 222–241, pls. 6*).—Six species from grape leaves are described (four in Palestine), of which *C. leoni* and *C. corynecioides* are new. Five species are illustrated.

Chlorosis of grapevines [trans. title], L. Casale (*Ricerca Sci. [Roma], 2 (1935), No. 11–12, pp. 440–443*).—The author presents experimental data, in part from his published work, on the relation of soil reaction and composition to grape chlorosis.

Excoriosis and copper dusts [trans. title], M. Biron (*Rev. Vitic., 84 (1936), No. 2168, pp. 42–45*).—Observations are given on the symptoms and course of excoriosis of grapevines due to *Phoma flacida*, on the injuries caused, and on sanitary, cultural, and fungicidal methods of reducing the inroads from the disease. The author's experiences with fungicides are briefly summarized, and special emphasis is given to the copper dust treatments which have been shown to offer an effective means of control.

Studies on the wastage of export grapes, with special reference to that caused by Botrytis cinerea, Pers., S. J. du Plessis (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 151 (1936), pp. 163, pls. 7, figs. 16; Dutch abs., pp. 147–150*).—This monograph gives special attention to the wastage due to *B. cinerea*, but the types of injury caused by nine other fungi are described. Comparative studies were made of seven monospore isolations of *B. cinerea* from grape, pear, apple, and quince (including cultural, morphological, fungicidal, and pathogenicity comparisons); field studies of wastage, including influencing factors (mechanical injuries, time of picking, fertilizers, etc.); and tests of various control measures. Formaldehyde gas fumigation yielded promising results, but some injury was caused. Satisfactory control followed spraying the bunches or wrappers with a 4-percent solution of formaldehyde in water, and particularly good results were obtained from a moderate spraying of the wood wool linings of the boxes. Ripe or overripe grapes proved much more susceptible to the storage rots than those in a greener condition.

A bibliography of 123 titles is included.

False mildew of red mulberry, F. A. Wolf (*Mycologia, 28 (1936), No. 3, pp. 268–277, figs. 3*).—The developmental morphology of a pleomorphic fungus, *Cercosporella arachnoidea* n. sp., is described. The conidial stage imparts the gross appearance of a powdery mildew on the foliage. At the time of leaf abscission in the fall the lesions are occupied by spermagonia and perithecial primordia. The perithecial stage matures in the spring and is here described as *Mycosphaerella arachnoidea* n. sp.

Notes on the strawberry strains of the bud and leaf nematode, Aphelenchoides fragariae, I, J. R. Christie and L. Crossman (*Helminthol. Soc. Wash. Proc., 3 (1936), No. 2, pp. 69–72, fig. 1*).—This article describes methods of artificially infesting strawberries, methods of rearing the strawberry strain by providing a growth of *Alternaria citri* on agar as a source of nutriment, injury from the treatment of strawberry plants with hot water, and the method

of differentiating the eggs of different nematodes frequently found on strawberries.

Citrus diseases and their control, H. S. Fawcett (*New York and London: McGraw-Hill Book Co., 1936, 2. ed., rev., pp. XV+656, figs. 187*).—This is a "completely revised, rewritten, and enlarged" edition of the work previously reviewed (E. S. R., 56, p. 751). "A number of new sections have been added, such as mal secco, water rot, areolate spot, bark blotch, sweet orange fruit scab, Australian citrus scab, Valencia rind spot, rind break-down, *Clitocybe* root rot, hard root rot, *Macrophomina* root rot, infectious mottling, zonate chlorosis, *Ascochyta* blight, cotton root rot, red root disease, *Ganoderma* root rot, xyloporosis, little leaf, mesophyll collapse, bordeaux injury, and new minor rots and effects. A new chapter on diseases due to deficiency and excess of inorganic constituents was written in collaboration with Dr. A. R. C. Haas. The new sections on sweet orange fruit scab, Australian citrus scab, and areolate spot were written in collaboration with Dr. Anna E. Jenkins, and the section on citrus blight in collaboration with Dr. A. S. Rhoads."

Elsinoe fawcetti, the perfect stage of the citrus scab fungus, A. A. Bitancourt and A. E. Jenkins (*Phytopathology, 26 (1936), No. 4, pp. 393–396, fig. 1*).—The perfect stage of the citrus scab fungus (*Sphaceloma fawcetti*) is reported from the rind of the Satsuma orange (*Citrus nobilis unshiu*) in São Paulo and is described as *E. fawcetti* n. sp.

The entomogenous fungi of citrus [trans. title], R. Benatar (*Rodriguésia, 1 (1935), No. 2, pp. 7–10, fig. 1*).—This note includes species of *Aschersonia, Podonectria, Sphaerostilbe, Septobasidium, Myriangium,* etc.

Die-back of coffee [trans. title], H. J. de Fluiter (*Alg. Landb. Weekbl. Nederland. Indië, 20 (1935), No. 2, pp. 34–36*).—This is a report from the Besoeki Experiment Station, describing the disease as it occurs in the Dutch East Indies and suggesting methods of control.

An anthracnose of hwangpee, Clausena lansium (Lour.) Skeels, in South China, L. Y. Li (*Lingnan Sci. Jour., 15 (1936), No. 1, pp. 113–117, fig. 1; Chin. abs., p. 117*).—A serious disease of the fruits of *C. lansium* was found to be due, at least in part, to *Gloeosporium* sp., and successful inoculations were also made on fruits of papaya, banana, pepper, chu sha kat (*Citrus erythrosa*), orange, lemon, guava, carambola (*Averrhoa carambola*), Chinese olive, roselle, avocado, sha lei (sand pear), and sugar-apple (*Anona squamosa*) with spores from pure cultures of the fungus obtained from affected fruits of hwangpee. The fungus appeared to be closely related to the *Gloeosporium* stage of *Glomerella cingulata*.

A bacillus isolated from diseased plants of Aucuba japonica (Thunb.), G. Trapp (*Phytopathology, 26 (1936), No. 3, pp. 257–265, fig. 1*).—The Japan laurel (*A. japonica*) is subject to a blight characterized principally by die-back of twigs, and hitherto unrecorded. From the more recently necrosed portions of affected plants, *Pseudomonas aucubicola* n. sp. was consistently isolated in pure culture. Since inoculations of healthy *Aucuba* tissues with recently isolated, vigorous subcultures failed to establish its pathogenicity, the organism must be classed, at least provisionally, as a saprophyte of special habitat.

A mosaic disease of iris, P. Brierley and F. P. McWhorter (*Jour. Agr. Res. [U. S.], 53 (1936), No. 8, pp. 621–635, figs. 4*).—This reports a cooperative study by the Oregon Experiment Station and the U. S. D. A. Bureau of Plant Industry, dealing chiefly with bulbous iris. The symptoms included general dwarfing, mosaic mottling of leaves, and "breaking" of flowers, though the last was not always expressed. Variations in degree of mottling and dwarfing occurred. In mosaic leaves the size of the epidermal cells was reduced, and X-bodies of vacuolate or reticulate types were sometimes present. The number of plastids was reduced in flecked areas of affected flowers.

The virus was transmissible through a wedge of diseased stem tissues or injection of diseased juice by hypodermic needle. The multiple-needle method and rubbing with virus-bearing juice proved ineffective. Plants inoculated in one growing season showed symptoms the following season. Field-cage experiments showed *Illinoia solanifolii* and *Myzus persicae* to be vectors,, but three other aphid species failed to transmit. The vectors were more efficient when migrating naturally than when manually transferred.

Cross-inoculations between varieties of Dutch and Spanish iris were readily successful. Mosaic was transmitted to bulbous iris from naturally infected *Iris ricardi*, from *I. unguicularis alba*, and from the bearded iris William Mohr. No hosts were found outside the genus.

Spotted wilt of the sweet pea, W. C. SNYDER and H. R. THOMAS (*Hilgardia [California Sta.], 10 (1936), No. 8, pp. 255–262, fig. 1*).—The virus of this disease of *Lathyrus odoratus* has been proved identical with that causing spotted wilt of tomato, and it has been recently reported as causing a streak disease of garden peas. The symptoms of the disease and inoculation experiments are detailed. The disease is a serious factor in certain coastal districts of California and is often complicated by mixtures with mosaic viruses. The large number of susceptible hosts increases the seriousness of the problem.

By mechanical inoculations and cross-inoculations, symptoms typical of spotted wilt of tomato and streak of sweet pea were induced irrespective of the virus source. Furthermore, with the juice from a streak disease of garden peas, spotted wilt symptoms were obtained on *Nicotiana glutinosa* and *N. tabacum*, and also 2 out of 16 inoculated sweet pea plants developed streak. These and similar data confirmed the conclusion that these viruses are identical.

Transmission of the spotted wilt virus to sweet pea was also obtained by means of *Thrips tabaci*. The virus may be separated from the mosaic viruses through differential hosts, but, since *Macrosiphum pisi* is not a vector of the spotted wilt virus, this insect may be used to isolate the mosaic virus where both are present in the same plant.

Control of the sweet pea disease appears to lie in the isolation of plantings from other susceptible crops or in protection against the migrations of infective thrips.

The black rot of chestnut fruits due to Sclerotinia pseudo-tuberosa [trans. title], G. ARNAUD and J. BARTHELET (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 2, pp. 48–51*).—This disease, "known from time immemorial in France and neighboring lands", is reported to be a serious menace to the culture and commerce of chestnuts. The symptoms, nomenclature of the causal fungus, time of infection, and various local observations are discussed briefly. As far as present knowledge can be generalized, it is concluded that the best means of avoiding the injuries is to harvest the nuts as soon as they fall and to keep them in a cold, humid place.

Researches on the preservation of chestnuts from molds by disinfection with water at 50° C. for 45 minutes [trans. title], O. SERVAZZI (*Bol. Lab. Sper. e R. Osserv. Fitopat. [Torino], 30 (1935), No. 6, pp. 191–203*).—This reports tests with hot water and fungicidal treatments of chestnuts against molds.

Dutch elm disease, Graphium ulmi, G. P. CLINTON and F. A. MCCORMICK (*Connecticut [New Haven] Sta. Bul. 389 (1936), pp. 697–752, pls. 8*).—The discovery of this disease, the recorded spread and extent of damage in Europe and America, and the control work carried on are historically reviewed, and the results of research on the disease and on the causal organism, *Ceratostomella ulmi*, are summarized with special reports on the field and laboratory studies in Connecticut.

Ceratostomella piceae, the cause of the blue stain on pine [trans. title], Y. NISIKADO and K. YAMAUTI (*Bot. and Zool.* [*Tokyo*], *3* (*1935*), *No. 2, pp. 365–376, figs. 6*).—The literature on this and related fungi is briefly reviewed, the injury is discussed, and the morphology and life history of the fungus and the host-parasite relations are described, all in Japanese.

Effects of pruning the roots of gas-injured trees, C. G. DEUBER (*Amer. Jour. Bot., 23* (*1936*), *No. 6, pp. 432, 433*).—Injury to roots, buds, and foliage occurred within 6 weeks after the roots of small oak trees were placed in water into which measured volumes of illuminating gas were passed. Though root decay was checked and new branch roots were formed in one lot where the root ends were pruned before repotting in soil, the tops of such trees showed no improvement over the controls in 2 yr.

Forest fire damage studies in the Northeast.—III, Relation between fire injury and fungal infection, P. W. STICKEL and H. F. MARCO (*Jour. Forestry, 34* (*1936*), *No. 4, pp. 420–423, fig. 1*).—Continuing this series (E. S. R., 73, p. 485), "observations on burned-over areas show that in northeastern forests between 28 and 45 percent of fire-scarred live trees become infected with fungi, causing decay of the sapwood within 3 yr. after burning. In northeastern hardwood stands, where merchantable values are so largely confined to butt logs, the presence of decay at the base is especially serious. The rapidity with which these sapwood rots infect the damaged live trees after fire indicates the necessity for early salvage cuttings if deterioration of such trees is to be prevented."

Testing methods for protecting wood against fungus invasion, I [trans. title], W. BAVENDAMM (*Angew. Bot., 18* (*1936*), *No. 2, pp. 132–141, figs. 3*).—This paper is the first on a series of studies of methods and results of wood impregnation with chemical preparations to prevent decay from fungus invasion. It has special reference to two proprietary preparations, "Basilit-U" (with sodium fluoride and a dinitrophenol compound as chief constituents) and "Fluralsil-Extra" (principally zinc fluosilicate), and a third material of unknown composition. The wood-block method was used in testing these materials against *Merulius lachrymans*, *Coniophora cerebella*, and *Polyporus vaporarius*, with promising results.

On the classification of the Tylenchinae, I. N. FILIPJEV (*Helminthol. Soc. Wash. Proc., 3* (*1936*), *No. 2, pp. 80–82*).—A key is given, with descriptions, as a basis for a new organization of related genera. Eighteen genera are included as follows: *Rotylenchus*, *Hoplolaimus*, *Pratylenchus*, *Tylenchorhynchus*, *Chitinotylenchus*, *Dolichodorus*, *Tetylenchus* n. g., *Halenchus*, *Psilenchus*, *Eutylenchus*, *Ditylenchus*, *Anguina*, *Iotonchium*, *Neotylenchus*, *Hexatylus*, *Hemicycliophora*, *Macroposthonia*, and *Ecphyadophora*.

The status of the nematode Aphelenchus avenae Bastian, 1865, as a plant parasite, G. STEINER (*Phytopathology, 26* (*1936*), *No. 3, pp. 294, 295, fig. 1*).—Although living chiefly as a saprophyte and most frequently associated with decayed or diseased material, *A. avenae* has been observed in the parenchyma of a hybrid phlox root together with recently deposited eggs, proving that this nematode is also able to sustain life in healthy plant tissue. This form must therefore be considered as a facultative plant parasite with perhaps dominant necrobiotic food tendencies.—(*Courtesy Biol. Abs.*)

A new species of Stylopage preying on nematodes, C. DRECHSLER (*Mycologia, 28* (*1936*), *No. 3, pp. 241–246, fig. 1*).—*S. leiohypha* n. sp., a fungus here described, was found in the soil, near Sanford, Fla., capturing and consuming nematodes up to 0.25 mm long and belonging to species of *Rhabditis*, *Cephalobus*, and *Acrobeles*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife Review, [December 1936] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. No. 7 (1936), pp. 50*).—The present number includes, in addition to the usual abstracts, author and subject indexes to the first seven numbers (E. S. R., 76, p. 355).

Animal life in Palestine: An introduction to the problems of animal ecology and zoogeography, F. S. BODENHEIMER (*Jerusalem: L. Mayer, 1935, pp. [8]+506, figs. [147]*).—The first and general part of this work (pp. 1–90) takes up the history of zoological exploration, the zoogeographical position, history of animal life, and general ecology of animal life in Palestine. Accounts of the mammals, bird life, reptiles and amphibia, insect life, other terrestrian animals, fresh water hydrobiology, and animal life on marine shores follow. Author and animal indexes are included.

Banding studies of semidomesticated mallard ducks, P. L. ERRINGTON and W. E. ALBERT, JR. (*Bird-Banding, 7 (1936), No. 2, pp. 69–73*).—Contributing from the Iowa Experiment Station, a report is made of the behavior of several hundred mallard ducks of all degrees of domestication that were released upon discontinuation in 1932 of a State game farm at Lansing, Iowa.

The majority of the data presented are nearly equally divisible into four chief categories. "A little over one-fourth of the 350 birds banded while young remained regular local residents until the second summer following. A little less than one-fourth remained until the first summer before they were lost track of; a similar number were recorded no later than the fall following banding. Almost exactly one-fourth were never retrapped nor heard of again. . . .

"The preponderance of the birds which have disappeared, we may suppose, are either dead or are living elsewhere. Numbers of those which have disappeared from the immediate area may be living somewhere, but the very low percentage of returns from birds shot by hunters (two-season total of 0.9 percent compared to Lincoln's [E. S. R., 72, p. 72] 12 percent first-season expectation for wild birds) does not indicate that very many have fully reverted to the wild state. It is significant to note that despite the immaturity of these birds at banding, three-quarters were known to have attained December size.

"One reasonable supposition is, if the records of the missing birds have not been terminated by death, that at least some of them have migrated only to establish themselves en route on refuges on which they have found things to their liking. The corn and open water of city parks, game farm wintering pens, private as well as public refuges, great and small, all on occasion have proved attractive enough to draw and hold stragglers from the outside, many of which have been distinctly tame from the time that they have come in."

It is considered to be doubtful that these birds would be able to live sedentary lives in North Central States marshes without winter feeding by man.

An economic study of the food of the ring-necked pheasant in South Dakota, H. C. SEVERIN (*[Brookings]: S. Dak. State Col., 1933, pp. 252, figs. 24*).—This report of a laboratory study of the food habits of the ring-necked pheasant (*Phasianus colchicus torquatus* Gmel. × *P. colchicus colchicus* L.), first introduced into South Dakota in 1912, is based upon observations and a detailed analysis of the crop and gizzard contents of each of 285 individuals obtained from all representative areas where the pheasant was able to maintain itself in goodly numbers since April 1929.

"Plants whose seeds were found in the food tubes of our pheasants totaled 116 species. The bulk of the seeds eaten were included in the Gramineae, while seeds of Compositae, Polygonaceae, Rosaceae, Leguminosae, Solanaceae,

Violaceae, and Caprifoliaceae made up most of the remainder. A total of 140,219 seeds were found, which averages approximately 492 seeds per bird. Economically considered, approximately 25.7 percent of these seeds were useful to man, 34.8 percent were neutral in character, and 39 percent were harmful. "While pheasants eat a large number of noxious weed seeds, they do not reduce the numbers of such seeds per acre sufficiently to make any practical difference to the farmer or gardener."

The animal food eaten consisted principally of insects, but a comparatively small number of spiders, millepedes, and snails, and a small amount of broken up pheasant eggshells were also taken. A total of 3,471 complete or nearly complete animals were found in the crops and gizzards, but of this number 3,375 were insects. Forty percent of the animals were flies and their larvae. Next in order were the Orthoptera with 20 percent, Coleoptera 16, Hymenoptera 11, Lepidoptera 9, Hemiptera and Homoptera 2, and the Neuroptera with 0.3 percent. Spiders constituted 2 percent of the total number of animals eaten, while the Diplopoda (millepedes) and the snails accounted for 0.5 and 0.4 percent, respectively. Forty percent of the entire lot of animals eaten were classed as harmful to man, 3 percent were useful, 27 percent neutral, and 30 percent doubtful.

Studies on the bank swallow Riparia riparia riparia (Linnaeus) in the Oneida Lake region, D. STONER (*Roosevelt Wild Life Ann.* [*Syracuse Univ.*], *4 (1936), No. 2, pp. 122–233, pl. 1, figs. 49*).—Studies of the life history and habits of the bank swallow reported include an account of its parasites and foot diseases and a four-page list of references to the literature.

The parasites of the muskrat (Ondatra zibethica L.) in the British Isles, T. WARWICK (*Parasitology, 28 (1936), No. 3, pp. 395–402*).—A list is given of the helminth and ectoparasites of the muskrat, with their continental distribution, and a table showing the incidence and distribution of the three most commonly occurring species of muskrat ectoparasites in Great Britain, namely, *Laelaps multispinosus* Burm., *Listrophorus validus* Banks, and *Dermacarus* n. sp. Of the five species of helminths of the British muskrat, two (*Notocotylus quinqueserialis* Barker & Laughlin and *Hymenolepis evaginata* Barker & Andrews) have been introduced with the animal. The three other species of helminths (*Capillaria hepatica* (Bancroft), *Taenia taeniaeformis* (Batsch) larva, and *T. tenuicollis* Rud. larva) have probably been largely reacquired from the local fauna. All of the three common species of ectoparasites (*L. multispinosus* (*Tetragonyssus spiniger*), *L. validus*, and *Dermacarus* n. sp.) occur in North America. Three other species (*Tyroglyphus* sp., *Myobia* n. sp., and *Polyplax* sp.) have occurred as single individuals, the last species having probably been acquired from the water vole (*Arvicola amphibius amphibius* L.). Introduction into Britain has greatly depleted the original helminth fauna as regards number of species and individuals, but not so with the ectoparasites. Lists of the parasites hitherto recorded from the muskrat are given and those of the brown rat (*Rattus norvegicus* Erx.) and water vole.

Plague infection discovered in fleas and lice taken from marmots in Montana and in a marmot in Utah (*Pub. Health Rpts.* [*U. S.*], *51 (1936), No. 34, pp. 1159, 1160*).—Record is made of the discovery by C. R. Eskey of plague infection in fleas and lice taken from ground hogs (marmots) killed in Small Horn Canyon, Mont., in July 1936. This finding is said to have provided the first direct evidence that plague exists among marmots in America and to demonstrate that the infection may be recovered from lice as well as fleas taken from these rodents. Fatal epizootics are said to have been noted among marmots in a number of localities in Western States, and reference is also made

to the discovery of plague in a sick ground hog killed in July 1936 in Indian Creek Canyon, Beaver County, Utah.

Studies on Strongyloides.—I, S. ratti in parasitic series, each generation in the rat established with a single homogonic larva, G. L. GRAHAM (*Amer. Jour. Hyg., 24 (1936), No. 1, pp. 71–87, figs. 2*).—Experimental rats were infected with a single homogonic larva of *S. ratti* each. "The infections were demonstrated by the appearance of larval progeny in fecal cultures collected from 5 to 11 days later. Of 181 rats exposed to a single larva each, 58, or 32 percent, became positive culturally. The pure-line strain of the parasite was passed serially through 14 parasitic generations by means of these single larva transfers without recourse to the heterogonic mode of larval development. Analysis of the data from the single larva infections indicates that a male parasite is unnecessary in the bionomics of *S. ratti* either to maintain parasitic fertility or to explain the two modes of larval development. Hyperinfection as a source of either hypothetical male parasites or additional parasitic females finds no support either factually or inferentially in the data. The parasitic phase of *S. ratti* is thus represented by a female organism, which is either syngonic or parthenogenetic."

A list of external parasites from birds of the eastern part of the United States, H. S. PETERS (*Bird-Banding, 7 (1936), No. 1, pp. 9–27*).—The author's studies have led to the recording of 108 different species of external parasites, including the Mallophaga or biting lice, the Hippoboscidae or bird flies, the mites, and the ticks taken from 255 species and subspecies of wild birds in various States east of the Mississippi River during the years 1928 to 1935, inclusive.

Plasmodium oti n. sp., a plasmodium from the eastern screech owl (Otus asio naevius), infective to canaries, F. WOLFSON (*Amer. Jour. Hyg., 24 (1936), No. 1, pp. 94–101, pl. 1, figs. 2*).—*P. oti*, isolated from the eastern screech owl and established in canaries, is described as new.

Ecological investigations of the liver fluke snail Limnea truncatula in Jaeren [trans. title], F. ØKLAND (*Meld. Norges Landbr. Høiskole, 16 (1936), No. 6, pp. 449–470; Ger. abs., pp. 467–469*).—A report of studies of *L. truncatula* in southwestern Norway, contributed with a list of 23 references to the literature.

A technic for clearing large insects, P. STAPP and R. W. CUMLEY (*Stain Technol., 11 (1936), No. 3, pp. 105, 106, figs. 2*).—A method that has been found to clear large insects successfully, highly pigmented animals and specimens with chitinous coverings being rendered translucent, is here described.

Photomicrography of opaque objects, J. G. PRATT (*Amer. Photog., 30 (1936), No. 6, pp. 348–352, 354, figs. 7*).—A contribution on the technic of insect photography, particularly as relates to the depth of focus.

Effect of low temperature in shortening the hibernation period of insects in the egg stage, F. FLEMION and A. HARTZELL (*Contrib. Boyce Thompson Inst., 8 (1936), No. 2, pp. 167–173*).—Egg masses of the eastern tent caterpillar collected in the fall were hatched at room temperature when given a pretreatment of from 8 to 12 weeks at 1°, 5°, and 10° C. The time required for hatching decreased as the period at low temperature increased. No hatching of larvae was obtained from those kept constantly at room temperature.

Eggs of the fall cankerworm also responded to low temperature exposures; while a few hatch when kept constantly at room temperature (about 22°), a much higher percentage is obtained at room temperature when preceded by periods of from 3 to 18 weeks at 1°, 5°, 10°, and 15°.

No low temperature treatment is required for the hatching of nymphs of the Chinese mantis. However, egg masses subjected for from 3 to 12 weeks at 5° were not injured.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1936, L. A. STRONG (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1936, pp. 3–23, 27–37, 46–53, 57–91*).—The work of the year (E. S. R., 74, p. 814) with fruit and nut insects included codling moth control by the use of insecticides, bands, sanitation, baits, and parasites; control of the pear thrips on pears and prunes; oriental fruit moth; peach borer; plum curculio; San Jose scale; grape berry moth; grape leafhoppers (the grape leafhopper and related forms); the grape rootworm; pecan nut casebearer; pecan casebearer; black pecan aphid; hickory shuckworm; pecan phylloxera *Phylloxera devastatrix* Perg.; raisin moth *Ephestia figulilella* Greg.; citrus rust mite; orange thrips; California red scale; rhinoceros beetle *Strategus quadrifoveatus* Beauv.; coffee insects; the pineapple mealybug; Japanese beetle; and fruitflies (the Mexican fruitfly, *Anastrepha serpentina* Wied., melonfly, Mediterranean fruitfly, and West Indian fruitfly); and the citrus blackfly.

Insects affecting forest and shade trees referred to include the Black Hills beetle, mountain pine beetle, western pine beetle, forest tent caterpillar, European elm bark beetle *Scolytus multistriatus* Marsh. and the native elm bark beetle *Hylurgopinus rufipes* Eichh. (both vectors of the Dutch elm disease), the gypsy moth and brown-tail moth, and the satin moth.

Cereal and forage insect investigations referred to include the European corn borer; corn earworm; 12-spotted cucumber beetle (a carrier of Stewart's disease), southwestern corn borer; fall armyworm; hessian fly; chinch bug; corn leafhopper *Peregrinus maidis* Ashm.; ortalid fly *Euxesta stigmatias* Loew; sugarcane borer; rice stinkbug *Oebalus pugnax* F.; corn leaf aphid, rusty plum aphid, a sedge aphid (*Carolinaia cyperi* Ainsl.), and *Aphis nerii* Kalt., which act as vectors of sugarcane mosaic; alfalfa aphid; alfalfa weevil; vetch aphid *Bruchus brachialis* Fahr.; lygaeid plant bugs and pentatomid bugs on alfalfa seed; range caterpillars; grasshoppers; the Mormon cricket; and stored-grain insects.

Truck crop, garden, greenhouse, tobacco, and bulb insects reported upon include wireworms, the Mexican bean beetle, pea aphid, lima bean pod borer and other pod borers, tomato pinworm, corn earworm, sweetpotato weevil, vegetable weevil, mole crickets (especially *Scapteriscus acletus* R. & H.), the turnip aphid, lettuce loopers (*Autographa* spp.), the European earwig, onion thrips, imported cabbageworm, cabbage looper, diamondback moth, strawberry weevil, strawberry root aphid, raspberry fruitworm, red berry mite *Eriophyes essigi* Hass., beet leafhopper, tobacco flea beetle,, tobacco hornworm, tobacco budworm, tobacco thrips, tobacco webworm, cigarette beetle, tobacco moth, gladiolus thrips, red spider mites and thrips, the bulb mite, and mushroom pests.

Cotton insects mentioned include the bollweevil (including possible injury to soils by calcium arsenate), cotton flea hopper, bollworm, pink bollworm, several hemipterous insects, the cotton root aphid, and the Thurberia weevil.

Data on bees include diseases, beeswax, pollination, and bee breeding.

Insects affecting man and animals mentioned are screwworms and other blowflies, hornflies, mosquitoes, sand flies, eye gnats, ticks, surgical maggots, and household and stored-product insects.

In work on insect identification and foreign parasite introduction particular attention was given to the importation of natural enemies of the oriental fruit moth, Japanese and Asiatic beetles, elm leaf beetle, and fruitflies.

Insecticide and related studies under way include control of insects by fumigation, sterilization of plant products by high and low temperatures, method of applying insecticides, physiology of insects, toxic effect of insecticides on

insects, toxicity of insecticidal combinations of tobacco and tobacco products on insects, tests to determine the effect of new insecticidal materials on insects, and chemical investigations on (1) insecticidal plants (tobacco, derris, pyrethrum, etc.) and their constituents, (2) development of synthetic organic insecticides, (3) the removal of spray residue, (4) development of inorganic insecticides, (5) fumigants for control of insect pests, (6) oils and oil emulsions, (7) accessory materials for use with insecticides, and (8) determination of the toxicity of new insecticidal compounds, using goldfish.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, E-392, sect. 1, pp. [3]+198, sect. 2, pp. [3]+199-358, sect. 3, pp. [3]+359-628; E-393, pp. 8; E-394, pp. 4; E-395, pp. 4; E-396, pp. 8, pls. 8; E-397, pp. 5, pls. 11*).—Further contributions in this series (E. S. R., 76, p. 501) are A Bibliography of Nicotine—II, The Insecticidal Uses of Nicotine and Tobacco, by N. E. McIndoo, R. C. Roark, and R. L. Busbey (E-392, 3 sections); The Vetch Bruchid *Bruchus brachialis* Fahraeus, by P. N. Annand and J. S. Pinckney (E-393); Sulphur Dips for the Control of Goat Lice, by O. G. Babcock (E-394); Carpet Beetles (E-395); The Machinery-Piping System of Flour-Mill Fumigation, by G. B. Wagner, R. T. Cotton, and H. D. Young (E-396); and The Distribution of California Buckeye in the South-Central Sierra Nevada Counties in Relation to Honey Production, by G. H. Vansell and W. G. Watkins (E-397).

[Report of work in entomology by the Arkansas Station] (*Arkansas Sta. Bul. 337 (1936), pp. 42-46*).—The work of the year reported upon (E. S. R., 74, p. 816) relates to the sugarcane beetle and the strawberry crown borer, both by W. J. Baerg; the striped cucumber beetle, by D. Isely; variations in codling moth injury in northwestern Arkansas, by Isely and H. H. Schwardt (E. S. R., 75, p. 609); and the biology of horseflies, by Schwardt (E. S. R., 76, p. 221).

[Report of work in economic entomology], D. B. Mackie and A. C. Fleury (*Calif. Dept. Agr. Bul., 24 (1935), No. 4, pp. 403-430, 505, 506, 507, 508, 509, 511-527*).—The occurrence of and control work with the more important insects and related pests in California in 1935 are reported upon (E. S. R., 74, p. 366).

[Report of work in entomology by the Delaware Station] (*Delaware Sta. Bul. 203 (1936), pp. 22-35*).—The more important insects of the year (E. S. R., 74, p. 66) and a study to determine the factors responsible for the development of one and two annual broods of the plum curculio are reported upon by L. A. Stearns; bionomics and control of the codling moth, by Stearns, D. MacCreary, W. R. Haden, and P. L. Rice; and mosquito investigations, by Stearns and MacCreary.

[Report of work in entomology by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1935-36, pp. 30, 31, 41*).—Brief reference is made to the work of the biennium (E. S. R., 73, p. 505), including zinc arsenate in codling moth control, oriental fruit moth parasites, control of other fruit tree pests, insects on ornamental plantings, termites, and dormant season sprays for aphids.

[Report of work in entomology by the Missouri Station] (*Missouri Sta. Bul. 370 (1936), pp. 51-55, 69, 70*).—The work of the year reported upon (E. S. R., 75, p. 77) includes biological studies on the codling moth, timing sprays by moth emergence, substitutes for arsenate of lead, mothproofing packing sheds, orchard control of codling moth and spray residue, effects of *Aenoplex carpocapsae* and weather on the codling moth, and bait trap experiments with codling moth, all by L. Haseman, L. Jenkins, and H. Koch; chinch bug control, hessian fly-resistant wheat varieties, and insect pests of melon and related crops, all by Haseman; the toxic action of various chemicals on codling moth larvae, by Haseman and

Koch; spraying tests with zinc arsenate, by H. G. Swartwout; and substitutes for arsenate of lead, by C. G. Vinson.

[Report of work in entomology by the New York State Station] (*New York State Sta. Rpt. 1936, pp. 39, 40, 48–62*).—The work of the year referred to (E. S. R., 74, p. 815) includes studies of calcium arsenate (E. S. R., 76, p. 215); spreading and wetting properties of insecticides and fungicides; spray residues; the codling moth and the tree hopper *Glossonotus crataegi* Fitch on apple; the codling moth on pears; the European red mite on plums; phototropic responses of the codling moth; insecticides used as dormant and early spring treatments; fruit insect investigations in eastern New York, particularly of the apple maggot, apple curculio, fruit tree leaf roller, scurfy scale, and white apple leafhopper on apple and several enemies of pears and small fruits; biological control of the oriental fruit moth by *Macrocentrus ancylivorus* and of the codling moth by *Ascogaster carpocapsae*; control of the oriental fruit moth on quinces; peach borers; nursery and ornamental insect pests, including the strawberry root weevil, black vine weevil, peach borer, oystershell scale, several spruce needle miners (particularly *Olethreutes abietana* Fern. and *Recurvaria piceaella* Kieff.), the juniper webworm *Phalonia rutilana* Hübn., a scale insect (apparently *Lecanium fletcheri* Ckll.) and its attack on *Taxus*, *Juniperus*, and *Thuja*, and the pine needle scale; insect pests of canning crops, particularly the pea aphid, root maggots, and cherry maggots; and vegetable insect investigations on Long Island, particularly with the cabbage looper, Mexican bean beetle, corn earworm, and the fall armyworm.

[Contributions on economic insects in Oregon] (*Oreg. State Hort. Soc. Ann. Rpt., 27 (1935), pp. 58–65, 123–130, 163–165*).—Contributions presented at 1935 meetings of the Oregon State Horticultural Society and the Western Nut Growers Association include the following from the Oregon Experiment Station: Strawberry Pests, Including Spittle Bug [*Aphrophora permutata* Uhl. and *Philaenus spumarius* Fall.], by W. D. Edwards (pp. 58–65), Common Errors in the Selection and Use of Sprays and Dusts, by R. H. Robinson (pp. 123–127), Control of the Pear or Prune Thrips [Pear Thrips] in Oregon, by S. C. Jones (pp. 127–130), and Wormy Filberts [*Balaninus* sp., probably *uniformis*, and *Melissus latiferreanus*], by B. G. Thompson (pp. 163–165).

[Contributions on economic insects and acarids] (*Ent. Soc. Brit. Columbia, Proc., No. 32 (1936), pp. 6–31*).—Contributions presented at the thirty-fourth meeting of the society (E. S. R., 73, p. 642), held in February 1935, include the following: The Production of Artificial Conditions Conducive to Winter Feeding of Ticks (*Dermacentor andersoni* Stiles), by J. D. Gregson (pp. 6, 7); Notes on the Moulting of Mites and Insects, by A. D. Heriot (pp. 8–10); A Check List of the Fleas of British Columbia, With a Note on Fleas in Relation to Sawdust in Homes, by G. J. Spencer (pp. 11–17); The European House Cricket (*Gryllus domesticus*) Now in Vancouver, by J. K. Jacob (pp. 18, 19); Entomological Illustrating, by G. R. Hopping (pp. 20–22); The Distribution of the Rhododendron White Fly [*Dialeurodes chittendeni* Laing] in British Columbia: Notes on Its Life History and Control Measures, by H. F. Olds (pp. 23–25); An Outbreak of *Autographa californica* Speyer Around Kamloops, Summer 1934, by G. J. Spencer (pp. 26–28); and Some Food Plants of Lepidopterous Larvae—List 3, by J. R. J. Llewellyn-Jones (pp. 29–31).

Pests of cultivated plants, M. H. Ruhmann (*Brit. Columbia Dept. Agr., Hort. Circ. 72 (1936), pp. 68, figs. 29*).—This general account of insect pests includes a discussion of sprays and spraying by B. Hoy (pp. 53–66).

[Economic insects in Kenya] (*Kenya Dept. Agr. Ann. Rpt., 1934, vol. 2, pp. 17–23*).—Brief reference is made to the occurrence of and work of the year with economic insects in Kenya.

Annual report of the division of entomology for the year ended 31st December 1935, R. W. Jack (*Rhodesia Agr. Jour., 33 (1936), No. 5, pp. 329–356*).—The occurrence of and work of the year with economic insects, including those attacking man and animals, are reported upon (E. S. R., 74, p. 228).

Report of the entomologist for 1935, C. B. Redman King (*Tea Res. Inst. Ceylon Bul. 13 [1936], pp. 35–40, fig. 1*).—The occurrence of and progress of work with insect enemies of tea in Ceylon in 1935 are reported.

A preliminary report on an entomological survey of Guam, O. H. Swezey (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 4, pp. 307–314*).—An annotated list is given of the crop pests known at the present time in Guam, based upon a survey conducted commencing on April 27, 1936.

Insect damage to Empire products, J. W. Munro (*Jour. Roy. Soc. Arts, 84 (1936), No. 4365, pp. 925–933*).—A general summary of information presented as an address.

Insects in relation to production of red clover seed, J. H. Bigger (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 60–63*).—The author considers the effect of insects on (1) the stand, (2) number of blooms, (3) condition of bloom, and (4) direct effect on seed.

Experiments with derris for control of insect pests in the Netherlands Indies, J. van der Vecht (*Landbouw [Buitenzorg], 11 (1936), No. 10, pp. 401–465, figs. 5; Eng. abs., pp. 461–464*).—Preliminary tests of derris made with various insects under field conditions in the Dutch East Indies are reported upon.

The relation between the degree of fineness of pyrethrum powder produced by different periods of grinding to toxicity to insects and to deterioration by light and air, C. L. Smith (*Jour. N. Y. Ent. Soc., 44 (1936), No. 4, pp. 317–339, pls. 3*).—Following a review presented with a list of 15 references to the literature the author reports upon experiments conducted, the details of which are given in tables. The results obtained have led to the conclusion that the finer the pyrethrum powder is ground the more rapid is the rate of paralysis of mosquito larvae and the speed of kill of the bean aphid. The tests on aphids were conducted both as sprays and dusts with duplication of results. The surface area of the ground particles exposed to the extracting medium appears in each case to be the determining factor. In paralytic and mortality tests conducted the finer the pyrethrum was ground the more rapid was the deterioration of the toxic principles upon exposure to light. Data were obtained which have shown that the deterioration of pyrethrum by light can be prevented for a limited time by either tannic acid, an antioxidant, or titanium dioxide, a pigment which absorbs the injurious wave lengths of light. The degree of protection secured does not vary with the different finenesses of pyrethrum powder. Even when the protectants are present, the pyrethrum powder begins to lose toxicity after a certain length of exposure. The material containing titanium dioxide holds its toxicity slightly longer than that containing tannic acid.

The practical use of insects for the control of insect pests and noxious weeds (*Kans. State Bd. Agr., [Quart.] Rpt., 55 (1936), No. 217–A, pp. 29–41*).—Two contributions are presented as follows: The Use of Insects for the Control of Insect Pests, by G. A. Dean (pp. 29–33), contributed from the Kansas Experiment Station, and The Use of Insects for the Control of Noxious Weeds, by S. G. Kelly (pp. 34–38).

Parasites introduced into Barbados for control of insect pests, R. W. E. Tucker (*Agr. Jour. [Barbados], 5 (1936), No. 1, pp. 1–22*).—This contribution reports upon 14 insect parasites that have been introduced into Barbados since 1927 in an attempt to secure biological control of various insect pests.

No positive results have been obtained from the majority of these introductions. Some projects, such as the establishment of *Lixophaga diatraeae* Towns. and *Pyrophorus luminosus* Ill. are still in progress, and one parasite, namely, *Paratheresia claripalpis* V. d. Wp., is to be reintroduced.

The status of *Bufo marinus*, the giant toad introduced over 100 yr. ago into Barbados, is discussed. The reasons for its diminution to the point of ineffectiveness are noted and suggestions made for its artificial propagation as a control over the pests *Lachnosterna smithi* and *Diaprepes abbreviatus*.

A biological study on some common Philippine termites, G. A. PANGGA (*Philippine Agr., 25 (1936), No. 3, pp. 233–265, figs. 16*).—The termites the biology of which is here noted include *Macrotermes gilvus* (Hagen), *Microcerotermes los-bañosensis* Oshima, *Coptotermes vastator* Light, *Nasutitermes luzonicus* Oshima, *Cryptotermes nocens* Light, *C. cynocephalus* Light, and *Hospitalitermes hospitalis* (Haviland).

The termite Microtermes pallidus Hav. in relation to tea in Malaya, G. H. CORBETT and N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 17 (1936), pp. [2]+12, pls. 4*).—This contribution includes the results of experiments aimed at the prevention of attack of tea by *M. pallidus*.

Mormon cricket control in Nevada, 1935, G. G. SCHWEIS and L. M. BURGE (*Nev. State Dept. Agr. Bul. 1 (1936), pp. 15, figs. 9*).—Details of control work with the Mormon cricket in which two methods of control were employed, namely, poisoning by the use of arsenical dust and trapping the migrating crickets, are reported.

Studies on Schistocerca gregaria Forsk., I–VII (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 639–645, pl. 1; 6 (1936), No. 2, pp. 188–262, figs. 6; 263–267; 3, pp. 586–590; 591–623, pls. 3; 624–664, pls. 5; 665–671, figs. 4*).—Seven contributions on studies of the desert locust (*S. gregaria*) are presented by M. A. Husain and the following junior authors: The Micropyle in *Schistocerca gregaria* Forst. and Some Other Acridiidae, M. L. Roonwal (pp. 639–645); The Biology of the Desert Locust, With Special Relation to Temperature, T. Ahmad (pp. 188–262); Why Do Locusts Eat Wool? A Study in the Hydromania of *Schistocerca gregaria*, C. B. Mathur (pp. 263–267); Colour Changes and Sexual Behaviour in Desexualised *Schistocerca gregaria* Adults, K. Das Baweja (pp. 586–590); Pigmentation and Physical Exertion, C. B. Mathur (pp. 591–623); Influence of Temperature on the Intensity and Extent of Black Pattern in the Desert Locust Hoppers Bred Crowded, T. Ahmad (pp. 624–664); and Factors Determining the Movement of the Vermiform Larvae, Des Raj Bhatia (pp. 665–671).

The spotted locust Aularches miliaris, J. C. HUTSON (*Trop. Agr. [Ceylon], 85 (1935), No. 2, pp. 127–129, pl. 1*).—This grasshopper (*A. miliaris*) is said to have been known as a periodical pest of estate and village crops in Ceylon for about 40 yr., mainly in the middle portion of the Central Province.

The bedbug and its control [trans. title], H. KEMPER (*Kleintier u. Pelztier, 12 (1936), No. 3, pp. 107, figs. 18*).—A monographic account of this pest, presented with a 12-page list of references to the literature.

Control of the bean leafhopper, S. W. CLARK (*Tex. Farming and Citricult., 13 (1936), No. 3, p. 13*).—Contributing from the Texas Experiment Station, the author describes an efficient and relatively inexpensive control measure employed against the potato leafhopper on beans which consists of a mixture of finely ground sulfur dust and ground pyrethrum flowers. "For dusting beans a ground sulfur should be specified, 99 percent of which will pass a 325-mesh sieve. Pyrethrum flowers should be added to the sulfur dust in sufficient quantity to bring the pyrethrin content to 0.05 percent. If quicker elimination of the hopper is desired, the pyrethrin content may be increased to 0.10 percent. This latter dosage is usually recommended.

"*If pure pyrethrum dust is used*, mix 1 part with 9 parts of finely ground, conditioned sulfur to make a dust containing 0.1 percent pyrethrins, but if an activated pyrethrum dust is used containing only 0.5 percent pyrethrins, mix 2 parts of the activated dust with 8 parts of finely ground, conditioned sulfur.

"The sulfur-pyrethrum mixture is usually applied at the rate of from 25 to 30 lb. per acre, depending on the size of the plants." Two treatments have been found to be sufficient in most cases, but three may be needed to control severe infestations.

Apple leaf-hoppers: An outbreak in Victorian orchards, K. M. Ward (*Jour. Dept. Agr. Victoria, 34 (1936), No. 7, pp. 328–330, 376, figs. 5*).—This contribution relates to *Typhlocyba australis* Frogg., a severe outbreak of which occurred in the northeastern section of Victoria during the season of 1935–36. It is said to be the first outbreak of its kind in apple orchards in that State.

***Additions to the New York State list of aphids, with notes on other New York species*, M. D. Leonard** (*Jour. N. Y. Ent. Soc., 44 (1936), No. 3, pp. 177–185*).—Forty-two species and 1 variety are added to the 128 species of Aphididae included in the list issued by the New York [Cornell] Experiment Station in 1928 (E. S. R., 58, p. 754), together with information on their occurrence and host plants.

Capitophorus aphids infesting Artemisia, G. F. Knowlton and C. F. Smith (*Canad. Ent., 68 (1936), No. 10, pp. 229–234, figs. 35*).—In this contribution from the Utah Experiment Station on aphids infesting *Artemisia*, or sage, of which plant there are approximately 75 species that occur in the Rocky Mountain region (several being of great economic importance as food for range livestock), 8 species of the genus *Capitophorus* are noted, of which 6 are described as new.

***The relation of aphids to the transmission of bean mosaic*, W. J. Zaumeyer and C. W. Kearns** (*Phytopathology, 26 (1936), No. 7, pp. 614–629*).—In virus transmission experiments with bean mosaic virus, 11 aphid forms collected from 17 different host plants were found to transmit the virus, namely, the melon aphid, cowpea aphid, bean aphid, *Aphis spiraecola*, the cabbage aphid, *Hyalopterus atriplicis* L., *Macrosiphum ambrosiae* Thos., the potato aphid, pea aphid, and the green peach aphid. A single species tested, *Neothomasia populicola* Thos., collected from the cottonwood tree, gave negative results. Fourteen species of aphids were found on beans in the field, and it is considered likely that a careful search would reveal more. Transmission studies with 10 species of insects other than aphids commonly found feeding on beans yielded negative results.

Atmospheric HCN fumigation for Latania scale on avocado fruits, D. L. Lindgren and H. L. McKenzie (*Calif. Dept. Agr. Bul., 25 (1936), No. 3, pp. 369–377, fig. 1*).—The results of fumigation control work with the *Latania* scale (*Aspidiotus lataniae* Sign. (E. S. R., 75, p. 380), conducted by the California Citrus Experiment Station, are reported upon. It is concluded that on avocado fruit this scale can be killed by atmospheric fumigation, a dosage of 25 cc of liquid hydrocyanic acid, or its equivalent, per 100 cu. ft. being recommended. With a load of 50 avocado boxes per 100 cu. ft., exposure should be for 1 hr., with electric fan circulation.

A study of the gypsy moth in the town of Petersham, Mass., in 1935, W. L. Baker and A. C. Cline (*Jour. Forestry, 34 (1936), No. 8, pp. 759–765, figs. 2*).—This is a report of a study aimed at the determination (1) of the reactions of the gypsy moth to its food supply in an area never before heavily defoliated, in order to learn whether it had increased to outbreak numbers irrespective of food plants or only in concentrations of favored food, and (2) of the extent any discriminating food habits of the insect that might be dis-

covered would permit the application of silvicultural measures of control in a particular locality.

A common tussock-moth, Porthesia (Euproctis) scintillans Wlk., in Canton (Lepidoptera: Lymantriidae), Y. C. Ng (*Lingnan Sci. Jour., 15 (1936), No. 3, pp. 483–486, figs. 5; Chin. abs., p. 486*).—The tussock moth *P. scintillans*, found in Canton and vicinity most of the year though not an extremely serious enemy of any one crop, is a quite important pest through being a general feeder.

Alucita niveodactyla Pag. (Microlepidoptera: Pterophoridae), a pest of sweet potatoes in Kwangtung, W. E. Hoffmann (*Lingnan Sci. Jour., 15 (1936), No. 2, pp. 311, 312, figs. 3; Chin. abs., p. 312*).—Notes are presented on a lepidopteran of the family Pterophoridae (*A. niveodactyla*), the caterpillar of which causes extensive damage, particularly during December, to leaves of the sweetpotato in the Canton area.

Injury to pines by Tortrix (Amelia) pallorana Rob., E. I. McDaniel (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 92–94, figs. 2*).—Observations made during an outbreak of *T. pallorana* among young pine transplants in the vicinities of East Lansing and Augusta, Mich., in 1936, in which the new growth on about 95 percent of the white pine was killed before discovery of the infestation, are reported upon. About 200 acres of from 4- to 6-yr. old white, red, Scotch, and jack pine transplants were involved. The plantings were mixed stands and all species were infested, but the larvae showed a decided preference for white pine.

The larvae encloses its food supply by drawing two or more tender shoots together and fastening them with a loose web. Where the shoots are close together all are excavated, for the larva does not confine its feeding to the tender needles but also tunnels into the tender new growth, such tunnels being extensive and new growth killed. The larvae were readily controlled by the application of either a contact or stomach poison, but since the infestation on pines occurs only when the new growth is developing rapidly, it is impossible to protect the trees with a single application. A spray consisting of 1 pt. of 40-percent nicotine sulfate to 100 gal. of water plus 4 lb. of dissolved soap is recommended.

The biology of the orange tortrix (Eulia (Argyrotaenia) citrana Fern.), W. H. Lange, Jr., (*Calif. Dept. Agr. Bul., 25 (1936), No. 2, pp. 283–285, fig. 1*).—The author records the finding of larvae of the orange tortrix webbing the needles and defoliating young potted Monterey pines at Berkeley, Calif., during the summers of 1933 and 1934. Later it seemed to be of little importance to young pines because of the few trees attacked. An account is given of its life history based on the successful rearing of 15 adults through the complete life cycle, supplemented with many partial records and observations on the trees under natural conditions.

The needle-tying moth Tortrix excessana Walk., A. F. Clark (*New Zeal. Jour. Sci. and Technol., 17 (1936), No. 5, pp. 679–685, figs. 4*).—The larva of the tortricid here considered is a source of much injury by webbing the needles together into a tube, the cuticle being consumed in whole or in part, causing them to turn brown and die. The attack reaches a climax after two or three seasons and then rapidly declines, in many cases ceasing completely.

The fruit leaf roller (Cacoecia argyrospila (Wlk.)), a defoliator of the orange in California, W. H. Lange, Jr. (*Calif. Dept. Agr. Bul., 25 (1936), No. 3, p. 387*).—The webbing and rolling of the leaves of orange trees and feeding on the buds by the larvae of the fruit tree leaf roller are reported upon.

Results of miscellaneous insecticides used on larvae of the peach twig borer in hibernation, H. K. Plank (*Calif. Dept. Agr. Bul., 25 (1936), No. 2,*

pp. 216–225).—In experimental control work with the peach twig borer, 34 different treatments were applied from December 9, 1932, to March 1, 1933, to 1-year-old water sprouts growing on peach stumps in two abandoned orchards in the center of the northern California cling peach district.

"A white mineral oil of about 52 sec. viscosity and 95 percent unsulfonated residue gave about the best results of the unemulsified oils tried and caused a minimum of injury to the parasites and the tree. A lighter oil blend and its combinations with toxic compounds injured the trees more or less severely, killed many of the parasites, and indicated somewhat inferior control of the borer. The heavy oils, emulsified or otherwise treated to make them emulsive or miscible in water, indicated very poor control and injured the twigs at the strengths used. The pine tar oils and beta-naphthol, employed by other workers in the control of the codling moth in hibernation, gave uniformly poor control of the twig borer in a similar state, though none injured the plant or seemed to affect the parasites. Commercial liquid lime-sulfur at the strength generally used to combat the borer during the early blooming stage of the peach gave control decidedly inferior to a number of oil treatments. The addition of fumigants did not seem to increase the toxicity of the sprays containing them nor adversely affect the parasites or the plant. Pyrethrum added to one oil and an oil emulsion seemed to improve very markedly the control of the borer without killing the parasites or injuring the plant.

"More extensive trials should be carried on, particularly with 'white' oils between 50 and 60 sec. viscosity alone and in combination with pyrethrum and nicotine, in order definitely to establish the value of these materials in the control of the peach twig borer in hibernation. The injurious effects produced on peaches by very 'light' and very 'heavy' oils of low sulfonation indicate what might be expected should materials of these classes be used in commercial applications."

Studies on the pine shoot moth (Evetria buoliana Schiff.) ([*Gt. Brit.*] *Forestry Com. Bul. 16 (1936), pp. 46, pls. 7, figs. 2*).—The biology and forest relations of the European pine shoot moth are dealt with by C. C. Brooks (pp. 0–26), and the status of the pest in East Anglia and experiments in control, by J. M. B. Brown (pp. 27–43). A bibliography of 52 titles is presented.

Codling moth control work in the Department of Puy-de-Dôme [trans. title], H. Soulié (*Ann. Épiphyt. et Phytogénét., n. ser., 2 (1936), No. 2, pp. 159–189, figs. 7*).—Data on the biology of the codling moth as influenced by temperature and humidity and the progress of control work are reported, with a list of 57 references to the literature.

Codling moth control investigation, W. W. Yocum (*Nebr. State Bd. Agr. Ann. Rpt., 1935, pp. 552–554*).—Codling moth control tests conducted in 1934 in an orchard at Shubert, Nebr., showed that nicotine sulfate used with oil gave the best control (29.9 percent wormy), followed by lead arsenate (27.4), Kalo (35.3), calcium arsenate (41.7), and Black Leaf 155 (45.9 percent). The results obtained with chemically treated bands were very irregular.

Variations in the effectiveness of chemically treated codling moth bands, G. A. Filinger (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 191–194*).—Work at the Kansas Experiment Station, the details of which are given in three tables, has led to the following conclusions: "Chemically treated codling moth bands are less effective in killing larvae during seasons of high temperatures than during normal seasons. Bands carrying a heavy load of β-naphthol are more effective than those with low β-naphthol content. Where heavy loads are used, tree trunks can be protected with asphalt emulsion, water glass, or linseed oil. Four-in. bands, unless very carefully dipped, are less effective than 2-in. bands. The addition of aluminum stearate to β-naphthol and oil makes the

chemicals sticky. Bands in which the chemicals retain a gummy, sticky consistency are more effective than those in which the β-naphthol becomes dry and crystalline."

California microlepidoptera, VIII, H. H. Keifer (*Bul. South. Calif. Acad. Sci., 35 (1936), No. 1, pp. 9–29, pls. 4*).—Of the five new species described in this further contribution (E. S. R., 74, p. 71), *Eucordylea huntella* bores into and destroys the flower buds of azalea, *Aristotelia eldorada* feeds on the young leaves and blossom buds of *Adenostoma fasciculatum*, and *Gelechia langei* attacks *Pinus ponderosa*.

California microlepidoptera, IX, X, H. H. Keifer (*Calif. Dept. Agr. Bul., 25 (1936), Nos. 2, pp. 235–259, pls. 7; 3, pp. 349–359, figs. 20*).—Part 9 of this continuation of the study above noted reports upon (1) moths of the genus *Gnorimoschema* (including *Phthorimaea*), six in number, of which two are described as new; (2) three species of the genus *Gelechia*, of which one is described as new; (3) one species of the genus *Decodona*; and (4) one new species of the newly erected genus *Arygrolocia*. In addition to descriptions of the adults and of the immature stages of some of the species, notes are given on their occurence and biology.

In part 10 the author reports having found that while adults reared from tomato and potato represent the true tomato pinworm a group of specimens almost entirely reared from native Solanums represents a darker species native to the State to which the name *Gnorimoschema elmorei* is given. "There seemed to be sufficient evidence that this darker species was native in the State, whereas the true pinworm had entered California from some point to the south." A description of the adults and notes on *Setiostoma fernaldella* Riley are also presented.

[Contributions on the control of the white rice borer Scirpophaga innotata Walk.] (*Landbouw [Buitenzorg], 11 (1936), No. 11, pp. 473–509, figs. 4; Eng. abs., pp. 482, 501, 502, 508, 509*).—The contributions presented are Biological Foundations of Riceborer-Control [*S. innotata*], by P. van der Goot (pp. 473–483); The Problem of the Rice-Borer in Krawang, by J. H. L. Joosten (pp. 484–502); and Experiences Concerning Irrigation in Connection With Control of the White Rice-Borer in West-Brebes (Residency Pekalongan, Java), by J. C. T. Kroesen (pp. 503–509).

A recent army worm outbreak, J. A. Weddell (*Queensland Agr. Jour., 45 (1936), No. 5, pp. 449–460, figs. 6*).—An outbreak of *Spodoptera exempta* Walk. which resulted in the destruction of forage crops and pasturage in the near Brisbane areas is reported upon.

Oviposition by Heliothis obsoleta Fab. on the silks of corn, W. J. Phillips and G. W. Barber (*Virginia Sta. Tech. Bul. 58 (1936), pp. 14, figs. 5*).—In this further report of their studies of the corn earworm (E. S. R., 71, p. 816), observations "of the silking periods of two varieties of field corn planted each year on 11 different planting dates in 4 yr. (1924 to 1927) at Charlottesville, Va., and in 3 yr. (1925 to 1927) at Richmond, Va.," are dealth with. "The number of earworm eggs received by the corn planted on the several dates selected is also discussed.

"From the results of field counts it was possible to construct curves showing the progress of silking in each of the 142 plats studied. . . . It was found that these silking curves were variable, both in respect to the duration of this period of growth and in respect to the percentage of plants observed in silk at any one time. These divergences were shown to be the result of varying weather conditions during the silking periods in the several years in which the studies were made. The curves for early and late plantings showed the greatest variation in the time covered by the silking, while those of the midseason plantings,

especially those of May 28, covered very nearly equal periods. The silking periods in plats of Boone County White corn average somewhat longer than those in plats of Reid Yellow Dent corn. The average duration of the periods when 10 percent or more of the plants had moist silks did not vary greatly in the plats of the several planting dates. The average duration of the periods when 50 percent or more of the plants had moist silks was somewhat greater in plats of midseason or late planting dates than in plats of earlier plantings. . . .

"The seasonal history of the insect varied greatly for the years covered by these studies, and consequently there was great variation in the number of eggs deposited per plant per day, not only for plats representing different planting dates but for plats of any one particular planting date. Notwithstanding this fact, it was clearly shown that the later the corn was planted the greater the number of earworm eggs it received during the silking period, with the exception of the year 1927, in which the seasonal history was most unusual. In general, early plantings of corn receive the least number of eggs during the silking period, midseason plantings receive a larger number, and late plantings receive the greatest number of eggs. Therefore, to lessen earworm injury, field corn should be planted on or before May 8 in the latitude of Virginia, or in localities where the seasonal history of the insect is similar, in order that the plants may receive the least number of eggs while fresh silks are exposed, and thus be less severely damaged by the earworms."

Studies of the ecology and control of cutworms in Tennessee, W. W. Stanley (*Tennessee Sta. Bul. 159 (1936), pp. 16, figs. 6*).—Information obtained on the growth rate of the immature stages of seven species of noctuid moths, particularly the dingy cutworm and *Feltia ducens*, when bred at constant temperatures showed the higher temperatures to accelerate development of all stages except the prepupal stage of the dingy cutworm and *F. ducens*. The increase in length of the prepupal stage of these two species at the higher temperatures appears to be a natural reaction which allows them to exist over a wide range of temperature conditions. "The other species studied are multiple-brooded, and they completed their growth in a relatively short time as compared with the dingy cutworms. The fall armyworm showed a more rapid rate of growth by completing its cycle in 24.4 days from egg to adult at 30° C. Moths of dingy cutworms confined at constant temperature showed that 28° was about the optimum for egg laying.

"A study of the climatic factors indicates that a dry fall (September, October, November) and a warm winter are the conditions that favor moth abundance for the dingy cutworm. A rather wet fall, with the remainder of the year dry, favored adult abundance of *F. subgothica*. Location of light traps affected the catch of moths. A trap on top of a 5-story building caught more moths than a similar trap operated on the ground or on an 18-story building. Moths have been caught from April 5 to December 23. More moths are caught during the last week of August and first week of September than at any other time. Near-normal rainfall is favorable for large moth catches. A variation from normal tends to decrease the moth catch.

"Data obtained from light traps operated in various environments, such as patches of tomatoes and corn, indicate that some species are attracted, others are repelled, and still others are not affected, by environment. Numerous tests with dingy cutworms showed that 0.5 lb. of sodium fluosilicate mixed with 25 lb. of wheat bran is more toxic to cutworms than paris green or other arsenicals used at the same strength."

Aids to the identification of anopheline imagines in Malaya, B. A. R. Gater (*Singapore: Govt., 1935, pp. 242, pls. 9, figs. 236*).—This handbook includes an index to the anopheline species and subspecies of mosquitoes of Malaya;

accounts of their external and internal anatomy; life history and habits; collection and rearing; preservation and mounting; and examination, maintenance, and dissection; notes on the use of keys; a table for rapid identification; a note on the illustrations of species; brief descriptions of species; etc.

A review of the Nearctic species of Chloropisca (Diptera, Chloropidae), C. W. SABROSKY (*Canad. Ent., 68 (1936), No. 8, pp. 170–177*).—This synopsis of the Nearctic species of the chloropid genus *Chloropisca*, contributed from the Michigan Experiment Station, is presented with notes on their distribution as checked by the author and a key to the 11 known species. *C. glabra* Meig., whose larvae are predaceous upon root aphids and are especially important predators of the sugar beet aphid, is the only species of which the life history is well known.

The fly problem in rural hygiene (*League Nations Health Organ. Quart. Bul., 5 (1936), No. 2, pp. 211–236, figs. 4*).—The following contributions are presented: Report of the Meeting of Entomologists Convened by the Health Organisation of the League of Nations on the Fly Problem in Rural Hygiene (held in London on December 16 and 17, 1935) (pp. 211–213); The Biothermic Method of Fly Destruction and the Ease With Which It Can Be Adapted to Rural Conditions, by E. Roubaud (pp. 214–218); Investigations Into the Fly Density in Hungary in the Years 1934 and 1935, by F. Lörincz and G. Makara (pp. 219–227); and On Flies Visiting Human Faeces in Hungary, by F. Lörincz, G. Szappanos, and G. Makara (pp. 228–236).

Studies on the influence of the environment on the sheep blow-fly Lucilia sericata Meig.—IV, The indirect effect of temperature and humidity acting through certain competing species of blow-flies, A. C. EVANS (*Parasitology, 28 (1936), No. 3, pp. 431–439, figs. 2*).—In a further study (E. S. R., 74, p. 73) of the comparative resistance to high temperature and various humidities of four species of blowflies (*Calliphora erythrocephala* Meig., *L. sericata*, *Sarcophaga falculata* Pand., and *Phormia groenlandica* Zett.), the last was found to be the most resistant and *C. erythrocephala* the least resistant species.

Further experiments upon the longevity of Xenopsylla cheopis Roths. (Siphonaptera), H. S. LEESON (*Parasitology, 28 (1936), No. 3, pp. 403–409, figs. 3*).—In further experiments (E. S. R., 68, p. 71) with the oriental rat flea, it was found that "fleas fed once before starvation lived longer than unfed fleas. There was no difference between survival of the sexes and no direct proportion between survival times and saturation deficiency. Fleas kept with the host for 7 days before starvation lived still longer. Females lived considerably longer than males, but there was still no direct proportion between survival times and saturation deficiency."

Recent developments in the use of electric light traps to catch the Asiatic garden beetle, H. C. HALLOCK (*Jour. N. Y. Ent. Soc., 44 (1936), No. 4, pp. 261–279, figs. 4*).—The results of a study of trap lights to catch the Asiatic garden beetle, commenced in 1927 and continued each year through 1934, are reported upon. It is pointed out that because of its attraction to light this beetle has become a nightly nuisance near brightly lighted places of business and amusement on warm summer evenings. A funnel trap 4 ft. in diameter with a 500-w daylight bulb, in use from 1928 to 1931, caught as high as 188,250 beetles during a season. Laboratory studies have shown that lights of short wave length near the violet end of the spectrum are most attractive to the beetle. The results of the work with 5 types of lights and 6 types of traps used in the experiments are reported upon. Some factors, such as temperature, type of light, and construction of trap, that influence the efficiency and usefulness of traps are discussed.

Life history and control of the Asiatic garden beetle, H. C. HALLOCK, rev. by I. M. HAWLEY and H. C. HALLOCK (*U. S. Dept. Agr. Circ. 246, rev. (1936), pp. 20, figs. 13*).—This is a complete revision of the account prepared in 1932 (E. S. R., 68, p. 791), the present status of knowledge of the pest being summarized.

The alimentary tract of the margined blister beetle (Epicauta cinerea marginata Fab.) (Coleoptera, Meloidae), R. T. EVERLY (*Ohio Jour. Sci., 36 (1936), No. 4, pp. 204–216, figs. 11*).—A study of the morphology and histology of the alimentary tract of the margined blister beetle, collected in southeastern Ohio, is reported upon with a list of 28 references to the literature.

The introduction of the Chinese ladybeetle into citrus groves, J. R. WATSON (*Citrus Indus., 17 (1936), No. 5, pp. 15, 18, 19*).—The ladybeetle *Leis dimidiata 15-spilota*, introduced into northern Orange Co., Fla., citrus groves from California as previously noted (E. S. R., 56, p. 855), is said to have survived two very unfavorable winters and to be spreading in a very satisfactory manner from the original center. It has been found over an area of approximately 15 miles in radius, occurring as far north as Winter Garden and in Orlando (E. S. R., 75, p. 658).

An anatomical and systematic study of the genus Anatis of America (Coleoptera, Coccinellidae), H. L. MCKENZIE (*Calif. Univ. Pubs. Ent., 6 (1936), No. 10, pp. 263–272, figs. 11*).—A description is given of six species of ladybird beetles of the genus *Anatis*, little of the life history of which is known. A list is given of the insects known to be fed upon by members of the genus and a bibliography of 27 titles.

Studies in the genus Aulicus Spinola (Coleoptera, Cleridae), E. G. LINSLEY (*Calif. Univ. Pubs. Ent., 6 (1936), No. 9, pp. 249–262, figs. 17*).—Twelve species of the genus *Aulicus* are recognized, of which 3 are described as new. Life history observations of *A. terristris* Linsley under laboratory and field conditions show a definite relationship between *A. terrestris* and the lubber grasshopper *Esselenia vanduzeei* Heb., upon the eggs of which the larvae feed. Of the lepidopterous larvae, Noctuidae are most commonly used for food.

Plowing as a means of destroying wireworm pupae in the Pacific Northwest, F. H. SHIRCK (*U. S. Dept. Agr. Circ. 407 (1936), pp. 8*).—Studies made by the Bureau of Entomology and Plant Quarantine and the Idaho Experiment Station, cooperating to determine the effect of plowing on wireworm pupae in irrigated lands of southern Idaho, are reported upon.

It was found that *Limonius californicus* and *L. canus*, the principal species met with, pass about 21 days in the pupal stage, the different individuals entering that condition from about July 15 to August 15. "The larvae and adults are not easily killed, but the pupae are extremely fragile and easily killed by injury, high temperatures, or the drying of the soil. Plowing to combat wireworms by destroying the pupae should be carried on during the first week of August in southern Idaho. It has been found that on the average approximately 75 percent of the pupae of *Limonius* can be killed by plowing. This represents a practical aid to wireworm control that can be accomplished with no additional expense except that involved in plowing to an average depth not more than 3 in. greater than the plowing depth now in vogue. Apparently the best results are produced by plowing to a depth of 8 or 9 in. and leaving the soil surface rough. No significant number of immature larvae are killed by ordinary plowing methods. Mechanical injury is apparently responsible for the larger portion of the pupal mortality, supplemented by the effect of exposure to summer heat and low humidities. Fields that have been in small grain and fields devoted to the production of early truck crops, such as peas

and early potatoes, can be plowed during the optimum period for destroying wireworm pupae."

Wireworm-infestation trends accompanying certain crop rotations in the Pacific Northwest, F. H. SHIRCK and H. P. LANCHESTER (*U. S. Dept. Agr. Circ. 408 (1936), pp. 10*).—In connection with the cooperative work above noted a study was made of crop rotations and cultural practices in their relationship to the reduction of wireworm numbers. Fluctuations in wireworm infestations were observed for four seasons under a variety of crop rotations.

Plats containing alfalfa and with low initial populations showed a gradual though significant increase in the number of wireworms during the 4-yr. period. It appears that abnormal conditions for wireworm survival may be developed through the growing of red clover or through the intensive drying out of the soil. "The former results in rapid increases in the number of wireworms. The drying of the soil was partially obtained through the growing of unirrigated wheat, in which case decreases exceeding 50 percent of the wireworms resulted in one season. In the instance of late truck crops where a dry mulch was maintained during much of the season of beetle flight, the infestation has remained about stationary. The only significant effect upon the infestations under pasture-sod conditions has been the reduction of the population in a plat which had a high initial infestation. Plats planted to sugar beets and general garden crops show an increase in number of wireworms fully as significant as that of alfalfa, although not so consistent. The variation in the crops included in this rotation may account for the irregularities."

The Coleoptera injurious to cereals and cereal products, P. WIRTH (*Les Coléoptères nuisibles aux céréales et aux produits dérivés. Paris: Libr. le François, 1934, pp. 125, figs. 34*).—This account is accompanied by a list of 122 references to the literature.

Relative susceptibility of ponderosa pines to bark-beetle attack, F. P. KEEN (*Jour. Forestry, 34 (1936) No. 10, pp. 919–927, fig. 1*).—A description is given of the bark beetle (principally the western pine beetle) susceptibility of ponderosa pines, based upon studies conducted by the author in southern Oregon and northern California from 1927 to 1932 and a review of earlier work. The subject is dealt with under the headings of age groups (four in number), vigor groups (four in number), relative susceptibility of the tree classes, and application to marking practice.

Rhigopsis effracta Lec. attacking grape buds in California, H. L. MCKENZIE (*Calif. Dept. Agr. Bul., 25 (1936), No. 2, p. 272*).—The curculionid weevil *R. effracta* has been found by the California Citrus Experiment Station infesting the buds of grapevines at Colton, Calif. There were usually three or four weevils on each bud, the buds of grape cuttings being eaten as rapidly as they could grow out, and many of the cuttings had ceased to grow. Fairly satisfactory control was obtained from the use of tanglefoot.

Notes on a European weevil, Ceutorhynchus assimilis Payk., recently found in the State of Washington, W. W. BAKER (*Canad. Ent., 68 (1936), No. 9, pp. 191–193*).—The author records the collection of *C. assimilis*, known in Europe as the turnip seed, radish seed, and cabbage shoot weevil, from mustard at several localities in Whatcom County and at Big Lake, Skagit County, Wash. Notes gleaned from the literature are given on its host plants, life history, and control in Europe, where it appears to be of considerable economic importance.

The nature of resistance in cotton plants to stem-weevil, K. DHARMARAJULU (*Assoc. Econ. Biol., Coimbatore, Proc., 3 (1935), pp. 21–31, pls. 3*).—The author finds that cotton plants resist an attack of the stem weevil *Pempheres affinis*

Fst. by regeneration and repair of the tissues each time the plant is attacked and by the production of a wound gum which kills the grub.

Package bees and how to install them, C. B. Gooderham (*Canada Dept. Agr. Pub. 507 (1936), pp. 11, figs. 7*).—This is a revision of Pamphlet 107 (E. S. R., 63, p. 359).

Catalog of the Hymenoptera.—I, Tiphiidae, edited by H. Hedicke (*Hymenopterorum Catalogus.—I, Tiphiidae. 's Gravenhage (The Hague): W. Junk, 1936, pp. 32*).—This first part of the work takes up the family Tiphiidae and includes an index to the species.

Notes on the introduction of Diprion parasites to Canada, L. R. Finlayson and W. A. Reeks (*Canad. Ent., 68 (1936), No. 7, pp. 160–166*).—The progress of the introduction of European spruce sawfly (*D. polytomum* Htg.) parasites from England into the Gaspé Peninsula is reported upon.

Egg placing by Dibrachys boucheanus Ratzeburg, F. L. Marsh (*Canad. Ent., 68 (1936), No. 10, pp. 215, 216*).—A description is given of the actual placing of the eggs of the cosmopolitan chalcid parasite *D. boucheanus*.

Notes on the classification of the Aphelinidae, with descriptions of new species, H. Compere (*Calif. Univ. Pubs. Ent., 6 (1936), No. 12, pp. [2]+277–321, figs. 19*).—In this systematic contribution 10 genera, including the new genus *Timberlakiella*, and 79 forms are recognized, of which 12 species are described as new. The primary parasites of this family are of more importance as natural enemies of scale insects than are those of any other group except the family Encyrtidae. Their value lies in the ability of certain species to control or partly control some of the most injurious pests of cultivated plants.

Spinose ear tick in India, J. S. Kingston (*Jour. Roy. Army Vet. Corps, 7 (1936), No. 3, pp. 142, 143*).—A report is made of the finding of the ear tick at Saugor, India, in a 7-year-old Australian remount gelding that had been bred and purchased in Queensland, Australia.

ANIMAL PRODUCTION

[Investigations in animal production] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1936, pp. 78–80*).—Progress is noted in the development of superior types of pigs through selective breeding and of beef cattle by suitable crosses of native strains with selected foreign breeds introduced for this purpose, methods for satisfactorily wintering range cattle at low cost, studies on quality of meat, and the development of wider uses for whey and other dairy byproducts.

[Animal husbandry investigations of the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1936, pp. 7–18, 19, 20*).—Results are reported from studies on factors affecting the quality of pork, beef, and lamb; the keeping quality of lards and vegetable oils; the yield and composition of milk from goats; development of apparatus for studies of cross sections and length and crimp of wool and hair fibers; records of performance of beef and dual-purpose cattle; and numerous breeding, feeding, and management studies with beef cattle, sheep, swine, horses, chickens, and turkeys. Much of the work was in cooperation with State experiment stations.

[Livestock investigations in Arkansas] (*Arkansas Sta. Bul. 337 (1936), pp. 37–40*).—Results are reported on the supplemental value of tankage, cottonseed meal, and buttermilk to yellow corn for pigs on rye pasture, and fattening pigs on Sudan grass pasture and in dry lot with a period of limited feeding as compared with full feeding for the entire period, both by E. Martin; and on factors affecting the storage quality of eggs, and rice byproducts in the laying ration, both by R. M. Smith.

[Livestock experiments in Delaware] (*Delaware Sta. Bul. 203 (1936), pp. 17–20*).—Additional results are briefly reported on studies previously noted (E. S. R., 74, p. 78), as well as on breeding for high egg production with special reference to the method of selection of breeding males, by A. E. Tomhave and C. W. Mumford.

[Livestock investigations in Michigan] (*Michigan Sta. [Bien.] Rpt., 1935–36, pp. 6–9, 25, 43–45*).—Studies with various types of livestock yielded results on the influence of breeding and age on the rate and efficiency of fattening in steers, the comparative carcass quality of heifers v. steers, liberal v. limited rations for the development of draft colts, the optimum allowance of skim milk for growing fattening pigs, alfalfa meal as a protein supplement for pregnant sows, the amounts of roughage desirable for fattening lambs, and winter rations for breeding ewes.

Results of poultry studies are reported on a comparison of electric and coal brooders in the production of winter broilers; the influence of varying amounts and qualities of proteins, minerals, and vitamins in baby chick rations; a comparison of different pasture crops for growing poultry; the effect of various rations on the cost of producing turkeys; and chick metabolism studies with special reference to factors influencing the incidence of perosis.

[Livestock investigations in Missouri] (*Missouri Sta. Bul. 370 (1936), pp. 8–17, 19–23, 45, 46, 70–73*).—Beef cattle investigations reported include pasture v. dry lot for full-feeding yearling steers, by L. A. Weaver, J. E. Comfort, and H. C. Moffett; winter rations for beef calves, by E. A. Trowbridge and Moffett; creep-feeding winter calves, the comparative values of legume hays for wintering native calves, and molasses-alfalfa supplements to grain rations for calves, all by Trowbridge, Comfort, and M. W. Hazen; a comparison of systems of grazing bluegrass pasture, by Comfort and E. M. Brown; and winter barley pasture by Comfort.

Results on fat lamb production are reported by Weaver and A. A. Dyer; rations for brood sows, by A. C. Hogan and S. R. Johnson; rations for weanling pigs, cane molasses in the ration of pregnant sows, and feeding swine on winter barley pasture, all by Weaver; various rations for work horses, by Trowbridge and Moffett; and the composition and relative feeding value of drought-stricken and river-bottom corn fodder and silage, and the value of molasses and other supplements to drought corn fodder for various classes of livestock, by Hogan, Trowbridge, Comfort, and Moffett.

Poultry tests yielded results on the nutritional requirements of poultry, grit in the all-mash chick ration, the normal growth rate of chicks, and the influence of time of hatch on growth, all by H. L. Kempster and E. M. Funk; the feed-purchasing power of the eggs laid by a hen, by Kempster; and temperature changes in eggs, the relation of the length of the incubation period to livability of chicks, and growth of turkeys in confinement, all by Funk.

Reported results of nutrition studies include synthetic rations for chicks, by Hogan; the effect of ultraviolet rays on vitamin B carriers, and anemia caused by deaminized casein, both by Hogan and L. R. Richardson; the nutritional requirements of rabbits and guinea pigs, by Hogan and Johnson; basal metabolism, endogenous nitrogen, creatinine, and neutral sulfur excretions as functions of body weight, by S. Brody, R. C. Proctor, and U. S. Ashworth; and endogenous nitrogen and basal energy relationships during growth, by Ashworth.

[Investigations with livestock in Montana] (*Montana Sta. Rpt. 1935, pp. 11–15, 16–19, 20–22, 42–44*).—Beef cattle studies at the main station and the Northern Montana Substation include wintering heifers on a high or low plane

of nutrition, and the relation of the type of bulls to birth weight, weaning weight, and subsequent rate of gain of their progeny.

The sheep studies gave results at the Huntley Substation on the use of beet byproducts in the lamb fattening ration. Dry land pasture studies at Huntley yielded results on the value of various annual and perennial crops as pasture for hogs. Chemical studies yielded information on the occurrence of mineral deficiencies in feeding stuffs, and the possibility of increasing the phosphorus content of feeds through phosphate fertilization.

The feed value of hay from pure cultivated grasses (English ryegrass, awnless bromegrass, and meadow fescue) [trans. title], W. KIRSCH, E. WENCK, and H. JANTZON (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 3, pp. 261–266; Eng. abs., p. 266*).—These three varieties of grasses cultivated in pure stands were harvested, dried on riders, and the feeding value of the cured hay determined by digestion trials with wethers. When reduced to a uniform dry matter content of 85.7 percent the digestible crude protein content and the starch values, respectively, were for bromegrass 5.74 and 33.4, ryegrass 5.16 and 39.2, and fescue 6.5 and 35.8. In feeding trials with dairy cattle the fescue proved superior to the other two hays, while the ryegrass imparted a typical bitter flavor to both milk and butter.

The effect of adding new preservatives for the acidification of green plant material on the composition and nutritive value of the resulting silage [trans. title], H. NEBELSIEK (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 3, pp. 161–185; Eng. abs., p. 185*).—This article describes the preparation of red clover silage, acidified with solutions of new proprietary phosphorus compounds designated as Penthesta red (SO_3) and Penthesta green (PCl_5). Both compounds produced satisfactory silage with small losses from fermentation. Metabolism trials with wethers and feeding trials with cattle are reported, showing both lots of silage to be palatable and of satisfactory nutritive value.

The effect of heat as used in the extraction of soy bean oil upon the nutritive value of the protein of soy bean oil meal, J. W. HAYWARD, H. STEENBOCK, and G. BOHSTEDT (*Jour. Nutr., 11 (1936), No. 3, pp. 219–234*).—Employing both the growth method and the nitrogen balance method for arriving at protein values, the Wisconsin Experiment Station has studied the effect of employing different temperatures during the extraction of soybean oil on the protein value of the resulting meal.

Raw soybeans were shown to contain protein of low nutritive value, likewise expeller meal processed at 105° C. for 2 min. or hydraulic meal cooked at 82° for 90 min. Expeller-type meals processed at 112° to 150° for 2.5 min., hydraulic-type meal cooked at 105° to 121° for 90 min., and solvent-extracted meal dried at 98° for 15 min. each contained protein of approximately twice the nutritive value of that in the raw beans or low temperature meals. The increase in nutritive value is partially due to increased digestibility of the protein but more largely to an actual increase in its biological value. This is apparently due to the fact that heat renders some essential protein fraction which is unavailable in the raw bean available for absorption and metabolic use.

The effect of cystine and casein supplements upon the nutritive value of the protein of raw and heated soy beans, J. W. HAYWARD, H. STEENBOCK, and G. BOHSTEDT (*Jour. Nutr., 12 (1936), No. 3, pp. 275–283*).—In further studies on the protein value of soybeans, it is shown that raw soybeans of both the Illini and Herman varieties contained an inefficient protein as measured by the grams of growth in rats per gram of protein consumed. The application of heat, either by autoclaving the raw beans for 1 hr. at 15 lb. pressure or by use of the expeller method of oil extraction wherein the beans are heated to 140° to 150°

C. for 2.5 min., practically doubled the nutritive value of the protein. The addition of 0.3 percent of *l*-cystine to the raw bean diet likewise approximately doubled the nutritive value of the proteins, but a similar addition to the heated bean diet was ineffective in further increasing the protein efficiency. A high level of casein as a supplement to the raw bean ration gave results similar to those obtained from the addition of cystine. This would indicate that cystine or its equivalent exists in the raw soybean in a form unavailable to the animal, and that heating causes the cystine fraction to become available.

The digestibility of Canadian feeding stuffs: Soybean oil meal, C. J. WATSON, J. C. WOODWARD, W. M. DAVIDSON, G. W. MUIR, and C. H. ROBINSON (*Sci. Agr., 17 (1936), No. 1, pp. 22–30; Fr. abs., p. 27*).—This is a report of trials conducted at the Central Experimental Farm, Ottawa, to determine the digestibility of expeller process soybean oil meal, using beef steers as experimental animals. Based on the determination of the digestibility of hay alone and of a hay and soybean oil meal ration, the calculated digestibility of the soybean oil meal was as follows: Dry matter, 86.8 percent, nitrogen 88.3, ether extract 88, crude fiber 111, nitrogen-free extract 83.8, and total carbohydrates 88.7. Compared with linseed meal, the soybean meal contained more digestible protein and more total digestible nutrients per 100 lb. of dry matter and on this basis is worth from $4 to $5 per ton more. Data obtained on the digestibility of soybean meal by other workers are shown to be of the same general order as that obtained in this investigation.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 411 (1936), pp. 47*).—This is the usual report of the analyses for protein, fat, and fiber of 1,975 samples of feeding stuffs collected for official inspection during April 1936 (E. S. R., 75, p. 678).

[A new toxicant occurring naturally in certain samples of plant foodstuffs.—XIV], The effect of selenium-containing foodstuffs on growth and reproduction of rats at various ages, K. W. FRANKE and V. R. POTTER (*Jour. Nutr., 12 (1936), No. 2, pp. 205–214, figs. 3*).—Continuing this series of investigations (E. S. R., 76, pp. 63, 245), groups of white rats were placed on toxic diet No. 582 at 21, 42, 63, 84, 105, and 186 days of age. The average ages of survival for these respective groups were 32, 211, 279, 247, 383, and 512 days. These results indicate a very rapid increase in resistance to the toxicant between 21 and 42 days of age. Rats able to survive the toxic diet for relatively long periods made subnormal growth, the general trend being a sharp drop in weight immediately following the change in diet, then an apparent equilibrium, after which the rats continued at a subnormal and irregular rate of growth until death. All groups showed a distinct loss in reproductive power, with all matings in which both animals were on the toxic diet completely infertile. It is suggested that farm animals approaching maturity may have considerable resistance to toxic grains and yet their growth rate and reproductive capacity may be so affected as to destroy the margin of profit for the livestock feeder.

Digestibility studies with ruminants, I, II (*Sci. Agr., 15 (1935), No. 7, pp. 476–487, Fr. abs., p. 484; 17 (1936), No. 1, pp. 11–21, fig. 1, Fr. abs., p. 19*).—Two series of digestion trials conducted at the Central Experimental Farm, Ottawa, are reported.

I. *Plane of nutrition and digestibility of hay,* C. J. Watson, G. W. Muir, and W. M. Davidson.—Four grade Shorthorn steers were fed a mixed clover and grass hay as a sole diet at levels of 2.5, 4.5, 6, 7.5, and 9 kg per steer daily, digestion trials being conducted at each level of feed intake. At the 2.5-kg level coefficients of digestibility were somewhat lower than at the higher levels, but within the intake range of 4.5 to 9 kg the plane of nutrition did not signifi-

cantly affect the digestibility of the hay, although in certain cases the individual constituents showed slight variation.

II. *Plane of nutrition and digestibility of a hay-barley ration*, C. J. Watson, J. C. Woodward, W. M. Davidson, G. W. Muir, and C. H. Robinson.—In a second similar series of trials four Shorthorn steers were fed a mixed ration of hay and ground barley in equal parts, being fed at levels of 1, 2, 3.25, 4.5, and 5 kg of each per steer daily. In digestion trials covering the entire range of feed intake it is shown that the apparent digestibility of the nitrogen significantly decreased as the plane of nutrition increased, amounting to about 6 absolute percent over the feeding range involved. The digestibility of the nitrogen-free extract also decreased slightly with the increased level of feed intake though it is considered of marginal significance, while the digestibility of dry matter, total organic matter, ether extract, and crude fiber were not significantly affected by the plane of nutrition.

The effect of hard water on metabolism in experiments with ruminants [trans. title], R. Hönigschmid and W. Liebscher (*Landw. Vers. Sta., 124 (1936), No. 5-6, pp. 329-344*).—This is a report of balance trials with 2.5-year-old wethers on a hay ration which in successive trials received drinking water of normal composition, water rich in calcium sulfate, and water rich in magnesium sulfate. Neither type of hard water adversely affected the digestibility of the organic constituents of the hay. The nitrogen balance was unaffected by the high calcium sulfate content but was markedly depressed by the water rich in magnesium sulfate. The food and water consumption was depressed and irregular when water high in magnesium sulfate was allowed.

The starch units required for live weight gain in the production ration of growing cattle [trans. title], G. Wiegner and S. Grandjean (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 4, pp. 287-299, fig. 1; Eng. abs., p. 299*).—In grazing trials with cattle in which pasture returns are evaluated by their estimated feed replacement value, the authors attack the fallacy of accepting a fixed starch value requirement per unit of gain in live weight of cattle (e. g., 2.5 starch values per kilogram of increase in body weight) without regard to age or live weight of the animal.

They show that 1 kg of gain in body fat requires 4 starch values, whereas 1 kg of gain in body protein requires 1.36 starch values. Formulas are presented for estimating the relative requirements for protein and fat production at different stages of growth. As a simplified standard for use in measuring pasture yields with grazing cattle it is proposed that animals be classified into three live weight groups, each with a normal requirement for gain in weight as follows: For cattle up to 250 kg live weight 1.5 starch values per kilogram of gain, from 250 to 450 kg live weight 2 starch values per kilogram of gain, and above 450 kg live weight 2.5 starch values per kilogram of gain.

Phosphorus deficiency metabolism and food utilization in beef heifers, M. Kleiber, H. Goss, and H. R. Guilbert (*Jour. Nutr., 12 (1936), No. 2, pp. 121-153*).—The California Experiment Station has conducted a series of metabolism and respiration trials with beef heifers at various levels of phosphorus intake. When the phosphorus intake was maintained at a level of 0.4 percent of the feed the heifers continued to gain in weight throughout the course of the trial and maintained the inorganic phosphorus content of the blood at about the initial level of 9 mg per 100 cc of serum, whereas heifers on a diet containing only 0.13 percent of phosphorus ceased to grow after 6 mo. They were able to maintain their body weight over a 1-yr. period when the phosphorus intake was reduced to 0.09 percent, but finally lost weight when the phosphorus was further reduced to 0.068 percent. During the course of the

phosphorus deficiency the inorganic phosphorus of the blood was reduced from the initial level of 9 mg per 100 cc to 3.9 mg. These animals showed a decreased appetite and developed bone chewing and coprophagia. The phosphorus deficiency did not affect body temperature, digestibility or metabolizability of the food energy, the respiratory quotient, or the level of fasting katabolism. However, it decreased the partial efficiency of energy utilization and also the efficiency of the food protein for sparing body protein.

Experiments at Craibstone on wintering cattle inside and outside, 1928–35, W. M. Findlay (*Scot. Jour. Agr., 19 (1936), No. 2, pp. 115–130*).—In a series of trials conducted by the North of Scotland College of Agriculture and extending over a 7-yr. period, similar lots of feeder cattle were wintered in the open with access to an open shed and under constant confinement in the barn. Turnips and straw were fed as the only ration in some trials, while in others some supplementary concentrate was fed. In certain trials the two lots were subdivided, one-half of the cattle in the barn being tied while the others remained loose in the pens, and in the outside group one-half was confined in courts while the other half had access to open fields.

In each trial the group in the open made greater total gains during the winter period, showing particular superiority during the latter half of the season. The method of handling apparently had little influence on the inbarn group, while of the outside groups those allowed run of the field excelled those confined in courts. The rate of winter feeding tended to affect the rate of gains during the subsequent summer grazing period. On the whole the open-field lots made the greatest combined winter and summer gain, were ready for the market at an earlier date, and gave a higher dressing percentage. There was a marked variation in the response of different individuals kept under the same conditions, indicating the desirability of good feeder stock.

Differentiation of fresh cattle and carabao meat by hemagglutination, R. A. Acevedo (*Philippine Jour. Anim. Indus., 3 (1936), No. 4, pp. 251–262, pl. 1, fig. 1*).—This study was actuated by the need of a test for differentiating between fresh beef and carabao meat as a means of protecting the public against the unscrupulous sale of the latter as beef. A technic is described for the preparation of anticarabao hemagglutinins which permitted the differentiation with a high degree of efficiency.

The influence of calcium salts and hay on the calcium and phosphorus metabolism of sheep fed mineral acid silage [trans. title], F. Schnepf (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 4, pp. 300–339, figs. 8; Eng. abs., pp. 338, 339*).—The extensive feeding of mineral acid silage to sheep resulted in a decreased appetite and negative balances for both calcium and phosphorus. The addition of calcium salts either as a carbonate or phosphate corrected the negative balances but did not improve the appetite of the animals. The addition of good clover hay equivalent to from one-third to one-half the dry matter in the ration corrected the negative calcium and phosphorus balances and markedly improved the appetite. The pH of the urine was decreased on the silage ration, negative calcium balances ordinarily being accompanied by a decreasing pH of the urine. No differences could be detected between the silages acidulated with hydrochloric acid or sulfuric acid, either as regards the quality of the silage or its effect on the metabolism of the animals.

Production and feeding of early lambs, W. E. Hunt (*Maryland Sta. Bul. 398 (1936), pp. 37–75, figs. 5*).—The results of two studies are presented.

I. *A comparison of Southdown and Ryeland rams as sires of early lambs.*—In an attempt to produce early lambs having desirable fattening qualities under Maryland conditions purebred Ryeland and Southdown rams were mated with

Dorset × grade Delaine-Merino ewes. All lambs by the Southdown ram were dropped between November 22 and January 7, while lambs by the Ryeland ram were dropped between December 9 and February 17. There was no significant difference in the average birth weight of the two lots of lambs. The 15 Southdown cross lambs averaged 46 lb. in weight at 64 days of age, and the 20 Ryeland cross lambs averaged 48 lb. at 70 days. The slight difference in average market grade in favor of the Southdown lambs is probably attributable to the higher proportion of twins in the Ryeland group. Representative lambs from each lot subjected to slaughter tests were practically identical in average dressing percentage and carcass grade. The Ryeland lambs had slightly longer and more open fleeces and sheared slightly heavier than the Southdown lot. Yearling ewes from the former group averaged 140.9 lb. as compared with 118.6 lb. for yearling ewes of the latter group.

II. *Fishmeal and cottonseed meal as protein supplements for ewes and their creep-fed early lambs.*—Three feeding trials comparing various rations are reported. In trial 1, involving two lots of ewes and their lambs, alfalfa hay was fed ad libitum to both groups, one of which received shelled corn as the sole concentrate ration and the other a mixture of 9 parts of shelled corn and 1 part of menhaden fishmeal. At 70 days of age the lambs in the former group averaged 2.9 percent more in weight than those in the latter group. In the second trial, involving three lots of ewes and their lambs, alfalfa hay was fed in limited quantity (2¼ to 2½ lb. per ewe daily) in the evenings and a similar quantity of timothy was offered in the mornings. Lot 1 received only shelled corn, lot 2 a mixture of 87 parts of shelled corn and 13 parts of cottonseed meal, and lot 3 a mixture of 9 parts of corn and 1 part of menhaden fishmeal. At 70 days of age the lambs in lots 2 and 3 averaged 10 and 11 percent, respectively, more than those in lot 1 which received no protein supplement. In trial 3, in which two lots of ewes and their lambs were used, roughage was fed as in the second trial. Lot 1 received a mixture of 7 parts of shelled corn and 1 part of cottonseed meal and lot 2 a mixture of 10 parts of shelled corn and 1 part of menhaden fishmeal. The lambs in lot 1 averaged 6.5 percent greater gains than those in lot 2, and the ewes in lot 1 gained 2.9 lb. per ewe as compared with a gain of 2.1 lb. for those in lot 2. The results indicate that when roughage is half leguminous and half nonleguminous satisfactory results cannot be obtained without supplying some source of high protein supplement in the ration. In all these trials the lambs on the corn-fishmeal ration consumed their feed readily and made excellent gains to 5 or 6 weeks of age but beyond this age they showed a marked dislike for the ration and feed consumption and growth rate fell below that of the other groups.

Lamb feeding in southern Alberta, W. H. Fairfield and K. Rasmussen (*Canada Dept. Agr. Pub. 478 (1936), pp. 52, figs. 14*).—This publication presents a summary of 18 years' experimentation in the feeding of range lambs for market. A total of 64 feeding trials has been conducted, and 37 different rations have been tested. Alfalfa is the only feeding stuff employed consistently in all trials. Variations in the rations included the feeding of oats, barley, and wheat, each singly and in various combinations, both ground and unground, and also the use of corn silage, sunflower silage, beet pulp, roots, molasses, and sheaf oats as other ingredients in the rations.

Full grain feeding was ordinarily more profitable than a two-thirds grain ration and was always definitely superior to a one-half grain ration, while self-feeding did not prove generally practical. The average daily gain for all trials was 0.32 lb. per lamb, while an average gain above 0.4 lb. daily was

frequently attained. The average rate of mortality for all trials was 0.75 percent. It is concluded that the finishing of lambs over a long term of years has provided a satisfactory profit over feed costs and interest charges. Appended are brief sections on general farm feeding practices and the utilization of the forest reserve for summer sheep range.

Comparative study on the productivity and adaptability of Berkshire, Duroc-Jersey, and Poland China pigs to local conditions, G. Miñano (*Philippine Jour. Anim. Indus., 3 (1936), No. 4, pp. 281–288*).—This is a study of the general adaptability of these three breeds of swine to Philippine conditions. Particular reference is made to the productivity, average length of productive life, resistance to common diseases, and general mortality. It is concluded that the Poland China is best adapted to local conditions, while the Duroc-Jersey and the Berkshire are about equal.

A contribution on the conducting of swine performance tests [trans. title], J. Schmidt and E. Lauprecht (*Züchtungskunde, 10 (1935), No. 1, pp. 11–17*).—In this experiment, involving two litters of nine pigs each, the pigs were fed individually to test the reliability of selecting two pigs from a litter as representative of the litter in a performance test. By making all possible combinations of one male and one female pig for both litters it is shown that either the heaviest pair or the smallest pair is less suitable than pairs consisting of pigs near the average weight for the litter. The results indicate that two average pigs from a litter may be satisfactorily used to measure the fattening ability of the litter.

Rice meal as a partial substitute for farm grains in the hog ration, E. W. Crampton (*Sci. Agr., 16 (1936), No. 9, pp. 489–494; Fr. abs., p. 494*).—This is a report of a study conducted at Macdonald College in which rice feed was fed to growing and fattening pigs at 25, 50, and 75 percent levels in a basal ration also containing barley and/or oats. The basal ration was supplemented with 15 percent of mixed protein concentrate during the growing period (42 days) and 10 percent during the subsequent fattening period.

Quite satisfactory results were obtained from all rations during the growing period, although there was a tendency for feed consumption to decline somewhat near the end of the period for all lots receiving rice feed, particularly those at the highest level. Because of the tendency for a high level of rice feed to produce soft carcasses and also because of its adverse effect on feed consumption, it is recommended that the fattening ration contain not more than 25 percent of rice feed. Barley proved superior to oats as an ingredient in the basal ration.

Feeding trials with raw and cooked soybeans in the rations of pigs [trans. title], V. Horn and E. Mühl (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 3, pp. 230–237; Eng. abs., p. 237*).—In the fattening trials reported a basal ration of steamed potatoes supplemented with barley, meat meal, fish meal, and chalk was fed the check group, while in the ration of two experimental groups a part of the barley and fish meal was replaced by ground raw soybeans and boiled whole soybeans, respectively. Under these conditions, where an ample supply of animal protein was provided in the meat meal the soybean rations produced practically as good gains as the check ration and at less cost. The cooked beans proved superior to the ground raw beans, although it is a question whether the difference was sufficient to justify the extra cost involved in cooking. When the intake of soybeans did not exceed 200 g per animal daily the quality of the fat was considered satisfactory.

Some studies on the causes of soft bacon, R. D. Sinclair (*Sci. Agr., 17 (1936), No. 1, pp. 31–41; Fr. abs., pp. 40, 41*).—In a report of studies at the University of Alberta it appears that none of a rather wide range of feeding con-

ditions described were directly responsible for the occurrence of soft carcasses in bacon pigs, although a high percentage of oats in the ration tended to increase the iodine number of the fat. Pigs slaughtered at minimum, optimum, and maximum live weights permissible for export bacon yielded carcasses of satisfactory firmness. It is shown that pigs fed during the winter months yielded fat of higher iodine number than that from summer-fed pigs, indicating a seasonal relationship to hardness of fat. Pigs allowed to become unthrifty and to make slow gains are more likely to be "soft" than those in a thrifty, rapid-growing condition. Individuals under the same conditions of feeding and management showed marked variation in degree of softness, suggesting the possibility of breeding for firmness of fat in the carcass.

[**Poultry Science Association, twenty-eighth annual meeting**] (*Poultry Sci., 15 (1936), No. 5, pp. 411–432*).—Following are listed the titles of papers presented before the annual meeting held at Virginia Polytechnic Institute, August 4–7, 1936, for which brief abstracts are presented: How Shall We Build Poultry Disease Control Programs in the Future? by R. E. Jones (pp. 411, 412); Labor Efficiency on Massachusetts Poultry Farms, by G. T. Klein (p. 412); Observations on the Mechanics of Ovulation in the Fowl, by R. E. Phillips (p. 413); Sterility in the Fowl, by F. R. Sampson and D. C. Warren (pp. 413, 414); The Relation of Some Egg Quality Factors to Hatchability, by E. M. Funk (p. 414); The Association of Certain Measures of Interior Egg Quality With Hatchability, by G. O. Hall and A. Van Wagenen (p. 414); Hatchability as Related to Season and Hour of Laying, by F. A. Hays (p. 414); A Six-point General Sanitation Program for Poultry, by P. W. Allen (pp. 414, 415); Differentiation of Paralysis in Chicks, by E. Jungherr (pp. 415, 416); Studies of the Clinical Manifestations and Transmissibility of Infectious Coryza of Chickens, by J. R. Beach and O. W. Schalm (p. 416); Studies of Infectious Coryza of Chickens With Special Reference to Its Etiology, by O. W. Schalm and J. R. Beach (p. 416); Studies in Coccidiosis in Chickens: Calcium Carbonate Additions and Coccidia, by C. E. Holmes, C. A. Herrick, and G. L. Ott (pp. 416, 417); The Control of Environmental Conditions for Egg Production, by F. L. Fairbanks (p. 417); The Effect of Environmental Conditions on Winter Egg Production, by J. H. Bruckner (pp. 417, 418); Problems in Creating a General Poultry Housing Plan Service, by W. M. Vernon (p. 418); Relation of Housing to Respiratory Problems, by C. D. Carpenter (p. 418); Texas Poultry House Problems, by D. H. Reid (pp. 418, 419); Problems in the Housing of Poultry, by W. C. Sanctuary (p. 419); Genetic Differences in Eight-week Weight and Feathering, by R. G. Jaap and L. Morris (pp. 419, 420); The Inheritance of Shank Color in Chickens, by P. D. Sturkie, C. B. Godbey, and R. M. Sherwood (p. 420); A Study of the Variability of Body Temperature in the Normal Chick, by W. F. Lamoreaux and F. B. Hutt (p. 420); Relationship of Sex to Feather Development in the Chick Embryo, by M. H. Radi and M. T. Harman (p. 421); The Incidence of Blindness and Paralysis According to Family, by C. W. Upp and B. A. Tower (p. 421); Some Trends in Poultry Housing, by D. C. Kennard (pp. 421, 422); The Connecticut 24′ × 24′ Poultry House, by R. E. Jones (p. 422); The Effect of Feeding Grit on Digestibility in the Domestic Fowl, by J. C. Fritz (pp. 422, 423); Protein Levels in the Fattening Ration as Influencing the Composition of the Thigh Muscle With Different Ages of Poultry Meat Stock, by W. A. and A. J. G. Maw, R. Holcomb, and L. H. Bemont (p. 423); Some Factors Influencing the Blood Calcium of Laying Hens, by H. J. Deobald, J. B. Christiansen, E. B. Hart, and J. G. Halpin (p. 423); Constituents of Wheat Gray Shorts Which Prevent Slipped Tendon, by R. M. Sherwood and G. S Fraps (p. 424); Factors Producing and Preventing Perosis, by V. G. Heller and R. Penquite (p. 424); Percentage of Unsalable

and Unusable Eggs, by J. C. Graham (p. 424); The Effect of Various Storage Conditions Upon the Ammonia Nitrogen Content of Eggs, by P. J. Schaible, J. A. Davidson, and S. L. Bandemer (pp. 424, 425); Vitamin A Requirements of Growing Chicks.—II, Pilchard Oil as a Source of Vitamin A, by J. Biely and W. Chalmers (p. 425); Vitamin A Content of Pilchard Oil, by H. I. Milne (pp. 425, 426); Further Studies on the Vitamin A Requirements of Chicks, by W. O. Wilson, C. H. Schroeder, and W. A. Higgins (p. 426); Vitamin D Requirements of Growing Chicks as Affected by the Calcium Content of the Ration, by J. R. Couch, G. S. Fraps, and R. M. Sherwood (pp. 426, 427); Vitamin G Studies: Flavines in Chick Nutrition, by R. M. Bethke, P. R. Record, and O. H. M. Wilder (p. 427); The Vitamin G Requirements of Laying Hens, by H. J. Davis, L. C. Norris, and G. F. Heuser (pp. 427, 428); Quality in Poultry Meat, by F. P. Jeffrey (p. 429); Variations in Egg Quality Characters in Certain Breeds, Varieties, and Strains of Chickens, by A. Van Wagenen, G. O. Hall, and H. S. Wilgus, Jr. (pp. 429, 430); A Method for Determining the Sex of a Turkey From the Hatching to Maturity, by J. C. Hammond and S. J. Marsden (p. 431); and The Modifying Influence of Environment Upon Growth and Sexual Development, by E. W. Callenbach (p. 432).

The normal growth of chickens under normal conditions, H. L. Kempster and J. E. Parker (*Missouri Sta. Res. Bul. 247 (1936), pp. 47, figs. 6*).—This study is based on observed growth rate of over five thousand chicks of Single Comb White Leghorn, White Rock, and Single Comb Rhode Island Red breeds hatched at the State Poultry Experiment Station farm over a 6-yr. period and reared under favorable (normal) conditions. Pullets of these breeds averaged 39.7, 41, and 41.5 g in weight, respectively, at hatching; 184, 179.2, and 186.2 g at 4 weeks; and 1,587.3, 2,290.3, and 2,480.5 g at 40 weeks of age. The greatest gains during any 4-week interval were in the ninth- to twelfth-week period for each of the three breeds. Differences in growth rate of males and females became apparent at 8 weeks of age, and at 20 weeks the White Leghorn, White Rock, and Rhode Island Red pullets averaged, respectively, 77.2, 78.2, and 80.8 percent as much as the cockerels. No significant relation was found between the age of the hens and the weight of their pullet progeny at 40 weeks of age. Early-hatched chicks made above normal gains up to 20 weeks but below normal growth thereafter, whereas the late-hatched chicks made subnormal gains up to 20 weeks but above normal growth as they approached maturity. These variations in growth rates of early- and late-hatched chicks appear to be associated with certain climatic conditions, particularly average maximum and mean temperatures for the periods.

Potatoes as a feed for chickens, M. J. Klooster and C. G. Card (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 104–108*).—In feeding trials with laying hens raw and cooked potatoes were each fed free choice and also were incorporated in the mash ration replacing one-half the corn. Raw potatoes were less palatable than cooked potatoes. Hens maintained their body weight on either ration, but those receiving raw potatoes did not maintain satisfactory egg production. However, the group receiving cooked potatoes compared favorably with the check lot in this respect. Excessive amounts of either raw or cooked potatoes had a laxative effect on the laying hens.

In trials with growing chicks substituting dried cooked potatoes or dried raw potatoes for one-half of the yellow corn in the mash ration or replacing all the corn with dried cooked potatoes resulted in more rapid gains than were obtained in the check lot. However, replacing all the corn with dried raw potatoes resulted in greatly retarded growth. Neither of the dried potato diets exerted a laxative effect on the chicks.

The quantities of vitamin A required by growing chicks, R. M. SHERWOOD and G. S. FRAPS (*Texas Sta. Bul. 528 (1936), pp. 15*).—The chicks used in this study were hatched from eggs laid by hens receiving experimental rations of varying vitamin A potency as previously noted (E. S. R., 72, p. 238). Chicks produced from hens receiving 325 Sherman-Munsell units of vitamin A per 100 g of feed had an average mortality of 64.4 percent, whereas chicks from hens receiving either 495 or 655 units per 100 g of feed had a mortality of 38.5 percent under the same conditions. Feeding liberal amounts of vitamin A to the chicks did not overcome the effect of the deficiency in the hens' ration. Chicks hatched from eggs rich in vitamin A have a lower vitamin A requirement for normal growth than chicks from eggs low in this vitamin, 125 units of A per 100 g of feed proving generally adequate for the former group whereas the latter required much larger amounts, possibly as much as 300 units per 100 g of feed.

Effect of different sources of vitamin D on the laying bird.—II, Storage of vitamin D in the egg and chick and mineral composition of the mature embryo, R. M. BETHKE, P. R. RECORD, O. H. M. WILDER, and C. H. KICK (*Poultry Sci., 15 (1936), No. 4, pp. 336–344, fig. 1*).—The last sentence of the abstract (E. S. R., 76, p. 234) should read "Vitamin D as irradiated ergosterol was less efficiently transferred to the egg than equivalent rat units from cod-liver oil, with evidence that the vitamin D occurring in the egg is in the same biological form as that fed to the hen."

The relation of vitamin G to the hatchability of hens' eggs, R. M. BETHKE, P. R. RECORD, and D. C. KENNARD (*Jour. Nutr., 12 (1936), No. 3, pp. 297–307*).—In a study at the Ohio Experiment Station it is shown that White Leghorn hens receiving a basal ration containing ground wheat, wheat bran, yellow corn, meat scrap, bonemeal, salt, cod-liver oil, and oystershell produced eggs of relatively low hatchability, while the inclusion of either alfalfa leaf meal, dried skim milk, dried whey, autoclaved yeast, dried liver, or wheat germ in the ration caused an increase in hatchability of the eggs produced. Similar results were obtained when menhaden fish meal or casein replaced meat scrap in the basal ration. These results together with the observation that the factor or factors could be extracted from alfalfa leaf meal, dried liver, or dried whey indicated that increase in hatchability was not associated with protein. Data presented show that the factor or factors were not associated with viamin B_4 or vitamin E but evidently were due to vitamin G (B_2 complex), and that this factor is essential for the normal embryonic development of the chick.

The effect of the ration of the hen on the vitamin G content of eggs with observations on the distribution of vitamin B and G in normal eggs, R. M. BETHKE, P. R. RECORD, and F. W. WILDER (*Jour. Nutr., 12 (1936), No. 3, pp. 309–320, figs. 4*).—In further studies on the distribution of vitamins B and G in eggs, it is indicated that vitamin B is present in the yolk of eggs but not in the egg white, while vitamin G is contained in both the white and yolk, and on a fresh egg basis is somewhat more potent in the latter. The inclusion of dried skim milk, dried whey, autoclaved yeast, dried liver, and certain fish meals in rations low in vitamin G definitely increased the vitamin G content of the egg produced. Evidence is also presented confirming the previous conclusion that hatchability of eggs is related to their vitamin G content.

Factors influencing the incidence of dietary hemorrhagic disease in chicks, H. J. ALMQUIST and E. L. R. STOKSTAD (*Jour. Nutr., 12 (1936), No. 4, pp. 329–335, figs. 2*).—Continuing the investigation on the dietary hemorrhagic disease in chicks (E. S. R., 74, p. 683), it is shown that the antihemorrhagic vitamin is present in the fecal matter of chicks on a diet containing none of this

vitamin. Its synthesis in the lower intestinal tract and also in droppings allowed to stand for 24 hr. has been demonstrated. It is evident that in studying this vitamin test chicks must not have access to their droppings. It is also shown that the antihemorrhagic vitamin is transferred from the diet of the hen to her chicks, so it is necessary to eliminate so far as possible all substances containing this vitamin from the ration of hens producing chicks for use in this study. The vitamin is present in egg yolk but not in egg albumin. It does not seem to be stored in the livers of young chicks raised on normal diets.

The rôle of certain inorganic elements in the cause and prevention of perosis, H. S. Wilgus, Jr., L. C. Norris, and G. F. Heuser (*Science, 84 (1936), No. 2176, pp. 252, 253*).—This report from the [New York] Cornell Experiment Station indicates that additions of either chemically pure calcium carbonate, calcium hydroxide, calcium chloride, mono-, di-, and tricalcium phosphate, or monosodium phosphate aggravated the occurrence of perosis in young chicks to about the same extent as bonemeal. However, the addition of a technical grade of monocalcium phosphate to the ration exerted a curative rather than a causative action on this ailment. Analysis revealed the presence of considerable manganese and also some iron and aluminum in this product. The addition of minimal amounts of manganese to the ration proved effective in preventing perosis at relatively high levels of calcium and phosphorus intake. Additions of small amounts of iron, aluminum, and zinc also exerted some beneficial effect. It is concluded that perosis is due to the lack of certain inorganic elements, notably manganese, while excess calcium and phosphorus aggravate its occurrence.

Egg farming, W. C. Thompson (*New York: Orange Judd Pub. Co., 1936, pp. 335, pls. 2, figs. 70*).—This is a practical manual dealing with the production of eggs and poultry for market as a profitable business enterprise. Successive chapters discuss the modern industry of egg farming in the United States; the economically useful types, breeds, and varieties of domestic poultry; poultry laying flock improvement; maintaining the health and productivity of well-bred laying stock; methods and practices of chick production and rearing on the egg farm; the economical and efficient housing of young and adult poultry; a practical feeding program for the adult poultry flocks on the modern egg farm; and the handling, grading, packaging, and distribution of table eggs.

Turkey production, A. J. MacDonald and M. S. Miller (*Harper Adams Agr. Col. Bul. 12 (1936), pp. 7, fig. 1*).—This bulletin deals primarily with the results obtained in rearing turkey poults from 7 to 28 weeks of age under intensive and extensive conditions.

In a trial including poults of both the Black Norfolk and American Bronze breeds, the lots received identical rations except that the intensive group received marrow stem kale as a succulent feed whereas the extensive group had access to good grass runs. At the end of the fattening period there was no significant difference in the weight or the quality of the carcass of the birds reared under the two systems, but the mortality rate amounted to 7.9 percent in the intensive lot and 36 percent in the extensive group. Blackhead infection was the primary cause of death in the latter but was not observed in the former group, indicating that intensive rearing is a satisfactory method of combating this disease. Treatment of blackhead-infected birds with chlorsan or carbon tetrachloride was ineffective for control of this disease.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Michigan] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 12, 13, 14, 22, 23, 25–27*).—Results are reported from studies with dairy cattle on the value of alfalfa hay in the ration; the

comparative value of alfalfa hay and alfalfa-molasses silage; the effect of supplementing a low phosphorus alfalfa ration with bonemeal on growth, reproduction, and milk production; the feeding of concentrates alone to ruminants; the relation of magnesium, phosphorus, and vitamin D in the ration; and vitamin D requirements of dairy calves.

Studies with dairy products yielded results on the vitamin A content of butterfat under various conditions; the effect of heat on certain chemical and physical properties of milk; and the influence of mastitis infection on the methylene blue reduction test and the relation of this test to bacterial plate counts in milk.

[**Investigations with dairy cattle and dairy products in Missouri**] (*Missouri Sta. Bul. 370 (1936), pp. 34–36, 42–45, 46, 47, 49*).—Dairy cattle investigations yielded results on the effect of increasing the interval between milkings and also the effect of injections of sterile solutions, milk, and oxygen into the udder on the yield and composition of milk, both by C. W. Turner and E. R. Garrison; the influence of the thyroid upon metabolism and milk secretion, by Turner and R. P. Reece; the composition of colostrum of the goat and changes which occur as the milk becomes normal, by Turner and A. J. Bergman; the effect of lactation on the blood sugar of dairy cows, and the cellular constituents of the blood as influenced by growth and lactation, both by Turner and H. A. Herman; milk supplemented only with minerals and vitamins as the sole diet for calves, by Herman S. Brody, and A. C. Ragsdale; the energetic efficiency of milk production and the influence of live weight thereon, by Ragsdale, Brody, and R. C. Proctor; and the effect of short-time gestations upon milk yield, the occurrence of polythelia in dairy cattle, and the butterfat production of cows possessing supernumeraries, all by Gifford.

Breeding, feeding, and management studies at the Hatch Experiment Farm are noted by Ragsdale and C. W. McIntyre.

Dairy products studies gave information on the crystalline structure of ice cream, by W. H. E. Reid and R. F. Reitemeier; the relation of air conditioning to the quality and crystalline structure of frozen desserts, by Reid and D. J. Gandhy; and a photomicrographic study of some of the factors affecting the physical properties of butter, by Reid.

[**Dairy cattle investigations in Montana**] (*Montana Sta. Rpt. 1935, p. 19*).—Results at the Huntley Substation gave further information on the economy of milk production when high quality roughages are fed as a sole ration to milking cows and the value of using high grade purebred sires.

Alfalfa-molasses silage vs. alfalfa hay as a roughage for lactating dairy cows, R. E. Horwood and J. G. Wells, Jr. (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 100–104*).—In a trial at the Upper Peninsular Substation second-cutting alfalfa ensiled in a fresh unwilted condition with the addition of 30 lb. of molasses per ton of alfalfa was compared with second-cutting field-cured alfalfa hay in a double reversal feeding trial with six milking cows. Either the alfalfa silage or alfalfa hay was fed as the sole roughage ration, and ground barley was the only concentrate fed each group. The alfalfa silage was readily consumed, and a portion of the material ensiled in an unchopped condition proved even more palatable than the chopped silage. The cows while on the silage ration consumed 35 lb. more digestible protein but 451 lb. less total digestible nutrients, produced 310 lb. more 4-percent milk, and gained 46 lb. less in live weight than when on the hay ration. No differences were noted in the general health of the two groups of cows. The alfalfa silage was found to have a relatively low carotene content, and the carotene content of butterfat samples averaged slightly less on the silage ration than on the hay ration.

Alfalfa silage, W. B. NEVENS and A. F. KUHLMAN (*Jour. Dairy Sci., 19 (1936), No. 9, pp. 611–617*).—The Illinois Experiment Station has conducted a series of experiments in which freshly cut alfalfa was ensiled in small experimental silos. Different lots containing 23, 25, 27, 32, and 39 percent of dry matter, respectively, when ensiled without preservative yielded silage having good keeping quality; the higher percentage of spoilage at 39 percent dry matter level would indicate that this is about the upper limit permissible for successfully ensiling alfalfa alone. The addition of from 1 to 5 percent of whey powder caused an increase in acidity of the silage, roughly in proportion to the amount of powder added. Molasses and the lactic acid and *Bacillus bulgaricus* cultures used each caused some increase in acid production, though none of these were as effective as whey powder in this respect. The mixing of corn and alfalfa resulted in a good quality silage. Ensiled unchopped alfalfa did not keep as well as the chopped material under the conditions of this experiment. In a brief feeding trial with milking cows the alfalfa silage proved palatable and appeared to have a feeding value comparable with that of corn silage, though having a more pronounced laxative effect on the animals than corn silage.

Vitamin A activity of third cutting alfalfa hay as affected by methods of curing, E. WOODS, F. W. ATKESON, H. WELLHOUSEN, and R. F. JOHNSON (*Jour. Dairy Sci., 19 (1936), No. 9, pp. 581–596, figs. 4*).—Employing methods for vitamin A assay as previously noted (E. S. R., 74, p. 677), the Idaho Experiment Station found that a fresh sample of cock-cured third-cutting alfalfa hay contained 308±13 rat units of vitamin A activity per gram. The leaves and stems of this hay contained 483±34 and 121±7 rat units, respectively. On this basis approximately 85 percent of the vitamin A activity was in the leaves. Another sample of this same hay ground and held at room temperature in diffused light for about 4 mo. contained 233±20 rat units, indicating a loss due to storage of about 24 percent. Two other lots of the hay cured in the swath for 1 and 3 days, respectively, then cock-cured and later sweated in the stock contained 144±10 and 116±9 rat units. Compared with the stored sample there was an apparent loss of about 28 percent in vitamin A activity due to sweating in the stack and a further loss of approximately 20 percent due to 2 additional days curing in the swath.

These results indicate that under reasonably good conditions as commonly encountered in hay curing in this area alfalfa hay should contain 100 or more rat units of vitamin A per gram, which would represent a potent source of this vitamin for dairy cattle under winter feeding conditions and should result in dairy products with a high vitamin A value.

Comparison of the feeding value of steam dried and flame dried menhaden fish meal, M. H. BERRY and J. R. MANNING (*Jour. Dairy Sci., 19 (1936), No. 10, pp. 663–669*).—This is a report of two separate feeding trials conducted at the Maryland Experiment Station in each of which two groups of yearling heifers were fed steam-dried meal and flame-dried meal, respectively, as 10 percent of their total ration. The remainder of the ration in each case consisted of clover hay 60 percent, yellow corn 20, and wheat bran 10 percent. The two meals were apparently equal in palatability. In each trial slightly more rapid growth resulted from the flame-dried meal ration, although these differences are not considered significant and it is concluded that the two are practically equal in growth-promoting properties at the level fed.

Ground versus unground grain for lactating dairy cows, A. L. DARNELL and O. C. COPELAND (*Texas Sta. Bul. 530 (1936), pp. 25*).—This bulletin reports the results of double reversal feeding trials with dairy cows to compare the

value of whole v. ground corn, whole v. ground oats, whole v. ground milo, and whole v. ground barley. In each experiment there was a greater consumption of concentrates by both groups of cows during the periods they were receiving ground grain in spite of efforts to obtain approximately equal consumption of the two rations. Much more whole corn was refused by the cows than any other of the whole grains, followed in order by milo, barley, and oats, indicating that the hardness and also the size of the grains had an influence on their palatability. Greater milk production was obtained during the periods of ground grain feeding in each instance. On the basis of the productive energy exchange the greater amount of milk produced during the period of ground grain feeding is largely accounted for by the greater consumption of concentrates.

Analyses of feed consumption and milk production records indicate that it is more profitable to grind grain for high-producing than for low-producing cows, this condition being more pronounced in the case of corn and barley than for oats or milo. The percentage of whole grain masticated was influenced more by the individuality of the animals than by the kind of grain fed. However, on the average, cows masticated a greater percentage of whole corn than of whole milo. Chemical analyses of grains before and after feeding showed that the cow obtained little if any energy from the unmasticated grain during its passage through the digestive tract.

The effect of feeding cacao shell to cows on the vitamin D content of butter (milk), S. K. Kon and K. M. Henry (*Biochem. Jour.*, *29* (*1935*), *No. 9*, *pp. 2051–2056*).—In experiments at the National Institute for Research in Dairying, it is shown that feeding 2 lb. of cacao shells daily to milking cows (equivalent to 32,000 international units of vitamin D) for 1 mo. resulted in increasing the vitamin D content of the milk and butterfat from winter to summer levels.

The calcium and inorganic phosphorus content of the blood plasma of normal dairy cattle, J. R. Haag and I. R. Jones (*Jour. Biol. Chem.*, *110* (*1935*), *No. 2*, *pp. 439–441*).—The Oregon Experiment Station has determined the calcium and phosphorus content of the blood plasma of a considerable number of normal dairy cattle of various ages. The calcium value of the blood plasma ranged from 8.05 to 11.48 mg per 100 cc, with an average of 9.99 mg, 92.5 percent of the values falling between 9 and 11 mg per 100 cc. The inorganic phosphorus values were less constant and appeared to follow a gradual decline with increase in age, ranging from an average of 7.74 mg per 100 cc in calves under 6 mo. of age to an average of 5.18 mg for all animals over 4 yr. of age.

Studies on the chemical composition of the blood of dairy cattle.—II, The effect of phosphorus intake on the calcium and inorganic phosphorus content of whole blood of dairy heifers during the period of first gestation and lactation, A. H. van Landingham, H. O. Henderson, and G. A. Bowling (*Jour. Dairy Sci.*, *19* (*1936*), *No. 9*, *pp. 597–609*, *fig. 1*).—Continuing this line of investigation (E. S. R., 74, p. 247), the authors have studied the effect of two levels of phosphorus intake on the calcium and inorganic phosphorus content of the blood of Holstein heifers during their first gestation and lactation periods. The rations for the two groups were composed of natural feeding stuffs without phosphorus supplement and were of similar nutritive value. The average daily intake of calcium and phosphorus, respectively, per head was 18.8 and 11.8 g for the low phosphorus group and 20.6 and 28.4 g for the high phosphorus group.

Based on blood analyses made at 4-week intervals throughout the gestation and lactation periods, it appeared that the lower level of phosphorus intake (equivalent to 1.2 g per 100 lb. of live weight) was sufficient to maintain the

inorganic phosphorus of the blood at approximately normal levels during gestation. Both groups showed a drop in blood phosphorus immediately following parturition, which was much more pronounced in the low phosphorus group. Milk production combined with low phosphorus intake resulted in a lower inorganic phosphorus blood level for this group until near the end of the milking period.

It appears that within the range of milk production encountered the phosphorus in the feed should exceed the phosphorus in the milk by 9 to 10 g per 1,000 lb. of body weight daily to maintain a normal inorganic phosphorus level in the blood. The calcium content of the blood was not appreciably affected by any of the conditions entering into this trial.

Influence of an increase in base intake on the acid base balance, health, and production of milk cows [trans. title], E. BROUWER (*Dept. Landb. en Vissch. [Netherlands], Verslag. Landbouwk. Onderzoek., No. 41 C (1935), pp. 521–560, figs. 2; Ger. abs., pp. 559, 560*).—This article presents an extensive review of the literature on the effect of excess bases in the ration on the well-being of the animal. In experiments with healthy milk cows it is shown that the presence of considerable excess of base in the ration did not noticeably disturb the health or production of the animals. The addition of calcium or sodium carbonate to the ration of cows receiving mineral acid silage did not produce alkalosis.

The development of calves in the Tropics, G. G. CARNEIRO and A. O. RHOAD (*Trop. Agr. [Trinidad], 13 (1936), No. 7, pp. 177–180, figs. 2*).—The results obtained from two Brazil experiment station dairy herds on the growth rates of normally fed calves, including purebred Holstein, purebred Brown Swiss, and crossbred Holstein-zebu, are reported. Comparing the growth rates of these calves with the Eckles normal for purebred Holsteins, it is shown that all the purebred calves made approximately normal growth up to 4 mo. of age. Beyond this point the rate of growth is retarded, this condition being particularly noticeable beyond 6 mo. of age. A study of the feed consumption records leads to the conclusion that environmental factors other than nutrition are responsible for this subnormal development. The crossbred calves reared under identical conditions developed normally.

[Dairying experiments in New York] (*New York State Sta. Rpt. 1936, pp. 21–24*).—Results are reported on factors affecting the quality of Limburger and similar types of cheeses, the control of abnormal municipal milk supplies, and the relation of udder infections to total production and chemical composition of the milk.

The relation of amino nitrogen content to quality of cream and butter, D. H. JACOBSEN (*South Dakota Sta. Bul. 304 (1936), pp. 11*).—The principal conclusions presented in this bulletin have been noted (E. S. R., 75, p. 687).

Accumulation of protein in the foam of skimmilk, P. F. SHARP, R. P. MYERS, and E. S. GUTHRIE (*Jour. Dairy Sci., 19 (1936), No. 10, pp. 655–662, fig. 1*).—In this report from the [New York] Cornell Experiment Station it is shown that in running skim milk through a separator as many as 16 times and removing the foam each time did not decrease its foaming capacity at temperatures ranging from 5° to 50° C. The protein content of the foam exceeded that of the skim milk from which it was obtained by 0.12 to 0.68 percent, and the increase in total solids in the foam was almost quantitatively accounted for by this accumulation of protein. The relative amounts of the major protein fractions in the skim milk did not change during repeated foaming.

In similar trials with whole milk no decrease in foaming quality was noted until partial churning occurred. Normal buttermilk foamed very little, while samples of the buttermilk extracted with petroleum ether foamed readily.

The decline in foaming ability of whole milk and the failure of buttermilk to foam is attributed to the presence of foam-breaking substances released by the fat globule rather than to the lack of foam-forming materials.

The phospholipids in milk.—IV, Their chemical nature and their distribution among some milk products, G. E. Holm, P. A. Wright, and E. F. Deysher (*Jour. Dairy Sci., 19 (1936), No. 10, pp. 631–639*).—Continuing this line of investigation (E. S. R., 71, p. 238), this phase deals with the chemical nature of the phospholipids of milk. The approximate solubilities of the phospholipid fractions are given, and the relation of these solubilities to certain analytical methods is discussed. The composite molecular weight has been tentatively established as 775.76, on which basis the factor for conversion of phosphorus into milk phospholipids would be 25. The results indicate the distribution of the phospholipids in certain milk products to be as follows: Whole milk 0.0337 percent, skim milk 0.0169, 41-percent cream 0.1816, butter 0.1819, and buttermilk 0.1872 percent.

The influence of method of sterilizing equipment upon development of oxidized flavor in milk, A. C. Dahlberg and D. C. Carpenter (*Jour. Dairy Sci., 19 (1936), No. 8, pp. 541–551*).—This study at the New York State Experiment Station was conducted with mixed herd milk produced under strict sanitary conditions and exposed only to aluminum utensils prior to time of pasteurization was used. Samples of raw milk and of different fractions of pasteurized milk collected off the cooler were scored for flavor at 1 hr. and 1, 2, and 3 days of age, and iron and copper determinations were made on each sample.

In all cases raw milk showed a satisfactory flavor at each stage of the test. In the case of hot water sterilization or chlorine sterilization followed by hot water rinse all milk, with the exception of the first 50 lb. coming off the cooler, maintained a satisfactory flavor over the 3-day period. The first 25 lb. of milk cooled in each case developed an oxidized flavor within 1 day, and the second 25-lb. fraction developed such flavors within 3 days. In the case of chlorine sterilization, the first 25 lb. of milk over the cooler had a pronounced coal tar flavor, and later fractions showed a much stronger tendency toward oxidized flavor than in the above trials, practically all samples developing this flavor within the 3-day period.

The solution of metals was not affected by the method of sterilization. In each case the first 25 lb. of milk discharged from the cooler showed a pronounced increase in both copper and iron, but later fractions showed only a slight increase over the raw sample. The raw sample averaged 0.131 and 0.379 p. p. m. of copper and iron, respectively, while the average of the pasteurized samples after discarding the first milk through the lines averaged 0.186 and 0.401 p. p. m. of copper and iron, respectively. The fact that the milk from chlorine-sterilized equipment was more susceptible to oxidized flavor indicates that the iron and copper contents of the milk are not the only factors involved in the development of this defect.

Quality control of market milk, N. E. Lazarus (*Milwaukee, Wis.: Olsen Pub. Co., [1935], pp. VIII+[1]+190, [figs. 44]*).—A manual for rapid classification and detection of organisms affecting the quality of milk and its products, with suggestions as to their source, action, and control.

Bacteria in relation to the milk supply: A practical guide for the commercial bacteriologist, C. H. Chalmers (*London: Edward Arnold & Co., 1935, pp. XII+192, pls. 4, figs. 31*).—A treatise dealing with the principles and practical application of laboratory methods for bacterial control of milk supplies.

Further studies of the composition of media for the bacteriological analysis of milk, C. S. Bowers and G. J. Hucker (*Amer. Jour. Pub. Health, 26 (1936), No. 4, pp. 350–352*).—In general the results obtained in this study confirm earlier

findings by the authors (E. S. R., 73, p. 837), tryptone-glucose agar and tryptone-glucose skim milk agar proving more efficient in the bacteriological analysis of milk than standard peptone agar or standard agar supplemented with glucose and skim milk.

Effect of temperature of incubation upon agar plate count of milk, C. S. PEDERSON and M. W. YALE (*Amer. Jour. Pub. Health, 24 (1934), No. 5, pp. 477–484, figs. 6*).—In a study at the New York State Experiment Station, 78 samples of dairy products, including pasteurized milk, raw milk, cream, and ice cream, were plated on standard agar plates, and duplicates were incubated at nine different temperatures ranging from 21° to 55° C. for 48 hr. In all products tested maximum counts were obtained at about 32°, with counts at 37° ranging from 50 to 70 percent as high as the 32° counts in most cases. Slight temperature variations around 32° gave much smaller errors in counts than around 37°. The percentage of maximum count obtained in 48 hr. is much more constant at 32° than at 37°. Apparently counts obtained at 32° serve as a better means of comparing the quality of different samples, and this temperature is recommended to replace the present standard.

Optimum temperature of incubation for standard methods of milk analysis as influenced by the medium, M. W. YALE and C. S. PEDERSON (*Amer. Jour. Pub. Health, 26 (1936), No. 4, pp. 344–349, figs. 3*).—*In a study at the New York State Experiment Station, 33 samples of raw and pasteurized milk were plated on tryptone-glucose skim milk agar and incubated at 11 different temperatures ranging from 18° to 55° C. During a 48-hr. incubation period the maximum number of colonies developed at slightly below 30° and slightly above 31° for the raw and pasteurized samples, respectively. These results correspond quite closely to those previously obtained when using standard peptone agar medium. It appears that (1) an incubation temperature of 32° or slightly lower is equally well adapted to either medium since it yields at least 95 percent on the average of the maximum 2-day count, (2) it is at the top of the curve where slight temperatures cause the least error, and (3) the percentage of the maximum 48-hr. count does not vary greatly between samples.* On the other hand, an incubation temperature of 37° was equally undesirable for either medium, since it yields only about 50 percent on the average of the maximum 2-day count and since it is in the steepest part of the descending curve so that variations in incubation temperature result in relatively large errors.

Evaluation of certain media for the detection of colon organisms in milk, C. N. STARK and L. R. CURTIS (*Amer. Jour. Pub. Health, 26 (1936), No. 4, pp. 354–356*).—The [New York] Cornell Experiment Station has studied the suitability of six media for the detection of colon organisms in milk with special reference to the ability of the medium to inhibit the growth of bacteria often responsible for false tests. It is concluded that crystal violet, Dominick-Lauter, and gentian violet broths are not satisfactory for this purpose since each in the presence of milk is relatively unselective in the type of bacterial growth sustained. Brilliant green bile broth is more selective, and its effectiveness is greatly improved by adding 0.5 percent sodium formate. Formate ricinoleate is considered entirely satisfactory in the detection of the colon group, inhibiting the growth of all false test organisms.

Attainable standards in the bacterial counts of raw and pasteurized milk, M. E. BARNES (*Amer. Jour. Pub. Health, 26 (1936), No. 6, pp. 561–566, figs. 2*).—This paper is based on a study of the raw milk supply of an Iowa State hospital extending over 43 mo. Following a period of cooperation with milk producers, during which time they were instructed in sanitary precautions necessary for clean milk production and in which the physical equipment of

the dairies was put in satisfactory condition, the raw milk delivered to the plant had an arithmetical average bacterial count of 1,600 per cubic centimeter, with a range of from 100 to 19,000.

It is suggested that 2,000 bacteria per cubic centimeter may be considered as the upper limit of an ideal zone within which mastitis and environmental factors are reduced to a minimum, while counts above this level indicate that either one or both of these factors are operative. The results obtained indicate that a logarithmic monthly average count of 5,000 bacteria per cubic centimeter in raw milk is within the possibility of attainment without necessitating an elaborate outlay of equipment in the dairy. Similar studies with the pasteurized milk supply led to the adoption of a maximum count of 1,000 per cubic centimeter as the criterion of excellence.

Classification of the organisms important in dairy products.—I, Streptococcus liquefaciens, H. F. Long and B. W. Hammer (*Iowa Sta. Res. Bul. 206 (1936), pp. 217–251*).—Employing the method described for the isolation of acid-proteolytic streptococci from dairy products, 65 such cultures from cheese, 23 from milk and cream, and 3 from butter were isolated, and these, along with 10 cultures obtained from other laboratories, have been extensively studied.

These 101 cultures were all identified as *S. liquefaciens*, and the different characters of each were found to be identical except for the rapidity of reduction of litmus milk and the fermentation of sucrose. These organisms coagulated milk by enzyme action rather than by the formation of acid, the titratable acidity at the time of coagulation averaging 0.27 percent and the pH 5.9. All cultures produced volatile acids, carbon dioxide, and acetylmethylcarbinol in milk, although the amounts produced by various cultures under uniform conditions varied widely. The rate of production was generally lower at the incubation temperature of 37° C. than at 21°. When incubated for 7 days at 21°, additions of either citric acid or acetaldehyde to skim milk cultures generally reduced the production of volatile acids and increased the yield of acetylmethylcarbinol. In five cases studied acetylmethylcarbinol was not oxidized to diacetyl nor reduced to 2,3-butylene glycol, indicating that the former is an end product. None of the cultures hydrolyzed butterfat or cottonseed oil, hence the species is considered nonlipolytic. Four cultures studied greatly increased the soluble nitrogen in milk, and proteolysis was largely complete after a short incubation period. The distribution of soluble nitrogen into the various fractions was similar in all cultures and at incubation temperatures of either 37° or 21°. The cultures remained viable at 5° over a long period. In six cultures studied heat resistance varied considerably with age. These cultures were all killed in 40 min. at 65.6°.

The action of aldehydes on certain cultures of Streptococcus liquefaciens in milk, B. W. Hammer (*Jour. Bact., 31 (1936), No. 5, pp. 479–487*).—In studies at the Iowa Experiment Station the production of acetylmethylcarbinol due to the action of certain cultures of *S. liquefaciens* in milk was greatly increased by the addition of rather small amounts of acetaldehyde.

Trials in which propionaldehyde, n-butyraldehyde, or n-valeraldehyde were added to milk containing these organisms showed an increase in the yield of acetylmethylcarbinol of the same order as that obtained by adding acetaldehyde, but little or no response resulted from adding formaldehyde or furfuraldehyde. Only in the trials with the n-valeraldehyde was there an indication of the formation of small amounts of a higher homologue of diacetyl.

The prevalence and classification of hemolytic streptococci in pasteurized milk, L. W. Slanetz (*Jour. Bact., 32 (1936), No. 1, p. 127*).—This brief report from the University of New Hampshire indicates that samples of pasteurized

milk showing counts of less than 10,000 by standard plate method sometimes contain as many as 50,000 hemolytic streptococci per cubic centimeter. Meat extract agar containing 1 percent proteose peptone and 5 percent sheep's blood was satisfactory for the detection and isolation of these bacteria. A detailed study of 20 such cultures showed them to be very heat-resistant, some strains withstanding a temperature of 70° C. for 30 min. On staining they appeared as long-chained streptococci, usually of the so-called alpha-prime type.

Sugar- and lactate-fermenting butyric acid bacteria [trans. title], J. VAN BEYNUM and J. W. PETTE (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, *93* (*1935*), *No. 9–12*, *pp. 198–212*).—In a study of butyric acid bacteria encountered in cheese making, cultures were isolated from milk by the Weinzirl test (E. S. R., 45, p. 75), using a culture medium of autolyzed yeast plus 1.5 percent of sodium lactate. Of those strains which did not liquefy gelatin it is shown that some have the ability to ferment lactose and others to ferment lactate, and in either case those fermenting one could not ferment the other. The lactose-fermenting group is not likely to prove detrimental in cheese manufacture. It is suggested that this group retain the name *Clostridium saccharobutyricum* (including *C. butyricum*). The lactate-fermenting group actively ferments glucose and levulose and sometimes galactose and arabinose, and is primarily the cause of gassy butyric acid fermentation in cheese. The authors have proposed the name *C. tyrobutyricum* for this group. By enriching milk bacteria in glucose medium and inoculating into a yeast autolysate plus lactate medium and into peptone solution plus mannite, it is possible to determine the presence of these two types of organisms since only *C. tyrobutyricum* will grow on the former and *C. saccharobutyricum* on the latter.

Butyric acid fermentation and lactic acid fermentation in silage [trans. title], J. VAN BEYNUM and J. W. PETTE (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, *94* (*1936*), *No. 19–23*, *pp. 413–433*).—Continuing this line of investigation (E. S. R., 76, p. 389), an explanation is sought for the fact that, although evidence of butyric acid fermentation is found in practically all lots of mineral acid silage, even those having a pH below 3, only silage having a pH above 3.5 has generally proved to be detrimental in cheese manufacture. It is suggested that since lactic acid fermentation occurs only at a pH above 3.5 it is theoretically possible to have two types of silage, namely, with and without lactic acid fermentation. The study noted above is referred to as indicating that rapid and uniform acidulation of silage to prevent lactic acid fermentation would eliminate the second type of butyric acid organism and render the silage harmless from this standpoint.

Effect of salts on the solubility of casein and paracasein, P. F. SHARP and T. J. MCINERNEY (*Jour. Dairy Sci.*, *19* (*1936*), *No. 8*, *pp. 573–579*, *figs. 2*).—This contribution from the [New York] Cornell Experiment Station gives the results of a study of the solubility of grain curd casein and other acid caseins and of paracasein (commercial rennet casein) at different pH levels and in the presence of 0.1 N and 0.5 N solutions of sodium chloride, sodium fluoride, and sodium iodide.

It is shown that the pH precipitation zone of paracasein is much wider than that of casein. Casein was completely soluble at a pH of 7 or above, and the presence of either the fluoride, chloride, or iodide increased the alkaline solubility zone, the iodide exerting the most pronounced effect in this respect. Paracasein showed marked insolubility at from pH 4.5 to 7, and the presence of either the chloride or iodide restricted the alkaline solubility zone. Sodium fluoride showed an anomalous behavior in that its presence caused a gradual increase in paracasein solubility as the pH increased from 5 to 10 which is

associated with precipitation of the calcium. The concentrations of sodium chloride and sodium iodide used markedly increased solubility of paracasein at a pH zone around 6, and it is shown that in the presence of a suitable concentration of sodium chloride paracasein has solubility zones at pH 2.5, 6, and 9.5, and zones of insolubility at 1, 4.5, and 7 to 9. The favorable effect of the peptizing action of sodium chloride on paracasein at a pH of 5.5 to 6 on the texture of Cheddar cheese is pointed out. Based on results of this study and other closely related studies, certain factors influencing the body and texture of processed cheese are discussed.

Paraffin waxing of baby Gouda cheeses, C. VAANDRAGER (*Farming in So. Africa, 11 (1936), No. 124, pp. 293, 294, fig. 1*).—In comparing the loss of moisture in baby Gouda cheeses (approximately 1 lb. each) when untreated, when dipped in pure paraffin wax, and when dipped in a special paraffin wax (melting point from 125° to 130° F.), it was shown that the loss in weight over a 28-day storage period amounted to 10.9, 2.49, and 0.69 percent, respectively. The pure paraffin proved unsatisfactory because the coating was very brittle and subject to cracking and blistering when handled. Waxing baby Gouda cheeses is considered essential because of the resulting decrease in loss of moisture, the prevention of tough rind formation, and the prevention of surface mold growth.

The bacteriology of Swiss cheese.—V, The use of Streptococcus thermophilus in ripening milk for Swiss cheese, W. C. FRAZIER, H. F. LONG, and W. T. JOHNSON, JR. (*Jour. Dairy Sci., 19 (1936), No. 8, pp. 535–539*).—This line of investigation (E. S. R., 74, p. 844) has been continued.

Ripening milk by inoculating with *S. thermophilus* (strain C_3) and holding at from 20° to 25° C. overnight gave unsatisfactory results, producing No. 2 cheese of lower grade than the control. Similar results were obtained from the use of *S. lactis* in the same manner, while the addition of this organism to the first milk in the kettle also gave unsatisfactory results. Most satisfactory ripening was obtained by inoculating the milk with *S. thermophilus* and holding it at 50° for from 30 to 60 min. Ripening periods of more than 60 min. generally resulted in a lowering of the grade. The beneficial effects of ripening with this organism is dependent on the ripeness of milk prior to inoculation as indicated by methylene blue reduction time. In general milk having a reduction time of less than 5 hr. is not benefited by this practice. Ripening part of the cheese milk with *S. thermophilus* may be of aid when the kettle milk acts "dead" or when the curd does not have the proper consistency in the kettle.

Studies on the emulsifying salts used in processed cheese, H. L. TEMPLETON and H. H. SOMMER (*Jour. Dairy Sci., 19 (1936), No. 8, pp. 561–572, figs. 6*).—This contribution from the Wisconsin Experiment Station presents a comparison of sodium citrate, potassium citrate, tetrasodium pyrophosphate, sodium metaphosphate, and a fusion mixture of equal parts of the mono- and disodium salts of orthophosphoric acid as emulsifying salts in the preparation of processed cheese. The salts were used separately in amounts ranging from 1 to 5 percent (1 to 3 percent for potassium citrate). Data are presented for the various concentrations of each salt used in relation to total moisture of the cheese, percentage loss of moisture during 11 months' storage, pH value, titratable acidity, body, degree of fat leakage, total ash, total nitrogen, water-soluble nitrogen, 5 percent of sodium chloride soluble nitrogen, and the sum of the water-soluble and sodium chloride soluble nitrogen fractions.

Properties of the cheese as judged by sight, taste, and smell indicated that all samples containing sodium citrate were satisfactory. Potassium citrate imparted a bitter taste which increased during storage. Two percent of pyrophos-

plate was satisfactory, but higher concentrations gave a bitter flavor and also tended to crystallize out in white lumps. The metaphosphate imparted a sour taste likely to be considered objectionable. Both of these salts have limited solubility, and moreover they produced a cheese of very firm body resistant to melting. It is concluded that none of the emulsifiers used were superior to sodium citrate, and it is doubtful if any are equal to it if all points are considered.

The use of sugar in making good quality ice cream, P. S. Lucas (*Ice Cream Trade Jour., 32 (1936), No. 4, pp. 34, 35*).—This article from the Michigan Experiment Station presents brief data on the effect of various concentrations of sugar in the ice cream mix on specific gravity, freezing point, time required to secure maximum overrun, and the maximum overrun obtainable. The suitability of various kinds of sugars for ice cream manufacture is briefly discussed.

Using corn sugar as an ingredient in the manufacture of ice cream, P. H. Tracy (*Ice Cream Trade Jour., 32 (1936), No. 2, p. 30*).—The Illinois Experiment Station briefly notes that corn sugar is less sweet than cane sugar, determined as of the order of 65 to 70 compared with cane sugar at 100. The use of 25 percent of corn sugar in the total sugar produced a smoother textured product of somewhat softer body. It lowered the freezing point, necessitating a somewhat lower freezing and also a lower dipping temperature. On the basis of consumer preference little difference was noted either as to flavor, body, or sweetness of ice creams containing 25 percent of corn sugar or all cane sugar.

The use of stabilizing agents in manufacturing ice cream, P. H. Tracy (*Ice Cream Trade Jour., 32 (1936), No. 3, pp. 31, 32*).—This article from the Illinois Experiment Station briefly reports the results of investigations dealing with the comparative merits of gelatin, sodium alginate, Hygell (a carob bean product), and fruit pectin as stabilizing agents in the manufacture of ice cream.

Are flavor and coloring sources of bacteria in ice cream? P. H. Tracy and M. J. Prucha (*Ice Cream Trade Jour., 32 (1936), No. 1, pp. 17, 18, 20*).—In this brief report of a study in progress at the Illinois Experiment Station the results secured indicate that such materials as fruits, nuts, candies, and other flavoring and coloring materials are frequently heavily infested with bacteria, and that under such conditions they may be considered a factor affecting the total number of bacteria in the finished ice cream. *B[acillus] coli* was found in more than 10 percent of all such samples tested, indicating unsanitary conditions in the preparation of these products. The possibility of correcting this condition by proper sanitary regulations is discussed.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1936, pp. 4–6, 20–23, 23–26, 39–60*).—The work of the year (E. S. R., 74, p. 693) dealt with the detection and control of Bang's disease; vesicular exanthema of swine; vesicular stomatitis; hog cholera and its control; the use of tuberculin, mallein, and abortin and stained diagnostic antigens; the eradication of scabies and anthrax; diagnosis and control of glanders, dourine, trypanosomiasis, and rabies; the streptococci involved in bovine mastitis; the transmission of infectious equine encephalomyelitis; investigations of equine infectious anemia; a dermatomycosis in guinea pigs; an unusual case of *Brucella suis* infection of swine; cultures of *Erysipelothrix rhusiopathiae;* a finding of the identity of the American and Australian laryngotracheitis virus; chickens with bumblefoot; an unusual form of fowl cholera; the treatment of hemorrhagic septicemia with soda; the applicability

of complement fixation in the diagnosis of anaplasmosis; stock-poisoning plants; tick eradication; tuberculosis in bovines, sheep, poultry, and swine; parasites of horses, ruminants, swine, poultry, and other animals; and treatment for internal and external parasites.

[**Work with diseases and parasites of livestock**], C. U. DUCKWORTH (*Calif. Dept. Agr. Bul., 24 (1935), No. 4, pp. 364–375*).—This is the annual report dealing with the occurrence of and control work with infectious diseases and parasites of livestock in California in 1935 (E. S. R., 74, p. 253).

[**Report of work in animal pathology, bacteriology, and parasitology by the Michigan Station**] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 9–12, 13, 14, 15, 16, 16–20*).—The work of the biennium reported upon (E. S. R., 73, p. 536) includes control and eradication of Bang's disease, nonspecific abortions, calf pneumonia, agglutination testing, streptococcic mastitis, sheep diseases, bacteriology of eating and drinking utensils, disinfection of poultry houses by means of fire guns, control of tapeworms, the effect of hardware cloth floors on the incidence of coccidiosis of domesticated animals, ameba studies, diagnosis of helminth infestations in living animals with special reference to diagnosis arrived at through fecal examinations, vaccinal immunization of cattle against Bang's abortion disease, the chemistry of *Brucella* cells, nonspecific agglutination in the *Brucella* group, and undulant fever.

[**Report of work in animal pathology by the Missouri Station**] (*Missouri Sta. Bul. 370 (1936), pp. 81–85, 91, 92*).—The work of the year referred to (E. S. R., 75, p. 102) includes low titer reactions to the Bang agglutination test in cattle, transmission of the Bang abortion infection of swine to cattle, and the significance of low agglutination reactions in unbred gilts, all by C. Elder; avitaminosis A in swine, by Elder and L. A. Weaver; toxemia in sheep, by Elder and A. W. Uren; the tube agglutination test compared with the rapid or plate tests on low reacting serums, by Elder and P. L. Piercy; fowl paralysis or neuritis of fowls, leucosis in fowls, blackhead in turkeys, pullorum disease testing in fowls, fowl pox vaccine distribution, and rabies diagnostic service, all by A. J. Durant and H. C. McDougle; Bang's disease testing and horse bot control campaign, both by Piercy; and diagnostic service on poultry diseases, by Durant, McDougle, and Uren.

Some diseases of farm animals (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 1, 7. ed. (1936), pp. VI+151, [pls. 5], figs. 10*).—A seventh edition of this practical account (E. S. R., 74, p. 391).

Report of the director of veterinary research for the year 1935, D. A. LAWRENCE (*South. Rhodesia, Dir. Vet. Res. Rpt., 1935, pp. 9*).—The results of work with laboratory products and service, research, and work with infectious and parasitic diseases are reported upon.

The phenol coefficient as a measure of the practical value of disinfectants, J. C. VARLEY and G. F. REDDISH (*Jour. Bact., 32 (1936), No. 2, pp. 215–225*).—The work reported upon has shown that "when coal tar disinfectants and cresylic acid disinfectants are diluted to 20 times their phenol coefficient, they are effective in killing representative pathogenic micro-organisms under practical conditions of use. It is further shown that disinfectants of varying strengths, that is, whether they have a high or low phenol coefficient, have the same germicidal activity and are equally effective under practical conditions when diluted to 20 times their respective phenol coefficients.

"As a result of these tests it is concluded that (1) the phenol coefficient figure is a suitable measure of the practical value of phenollike disinfectants when the factor '20 times the phenol coefficient' is employed for calculating the dilutions for use in practice. (2) Disinfectant solutions made up to 20

times their phenol coefficient are of sufficient strength to kill very large numbers of disease-producing micro-organisms under practical conditions. (3) When dilutions for use are made on this basis, coal tar disinfectants and cresylic disinfectants should be equally germicidal. (4) When phenollike disinfectants are diluted in this way they should be as effective in killing disease-producing micro-organisms under practical conditions as is 5 percent carbolic acid."

Stimulation of healing in non-healing wounds by allantoin occurring in maggot secretions and of wide biological distribution, W. Robinson (*Jour. Bone and Joint Surg., 17 (1935), No. 2, pp. 267–271*).—In reporting upon maggot therapy (E. S. R., 74, p. 256; 76, p. 246) the author presents a preliminary account of work with allantoin, a constituent of the urinary secretions of surgical maggots and of common occurrence in plants and animals, the therapeutic value of which was first called to attention by Macalister (E. S. R., 28, p. 580).

The treatment of hospital cases in Washington and New York has shown that allantoin stimulates healing, with abundant growth of healthy granulation tissue in slowly healing suppurative wounds. The excretion of this substance into the wound is considered to be one of the factors contributing to the remarkable healing effects obtained in maggot therapy, although the claim is not made that it can be substituted for maggots. It is pointed out that allantoin, which is bland, stable, and harmless, has no odor, and is nonstaining, can be obtained commercially, and that the treatment is simple, painless, and inexpensive.

The account is accompanied by a list of 11 references to the literature.

Use of urea to stimulate healing in chronic purulent wounds, W. Robinson (*Amer. Jour. Surg., n. ser., 33 (1936), No. 2, pp. 192–197*).—In continuation of the work above noted, the author reports having found urea as well as allantoin to stimulate healing in chronic purulent wounds. Fourteen typical case histories supplied by medical cooperators are briefly presented with a view to bringing the use of this simple, harmless, and effective treatment to the attention of those who have cases of chronic external suppurating wounds.

The application of a 2-percent solution results in the cleansing of such wounds by the removal of necrotic material and pyogenic bacteria present and a promotion of the growth of granulation tissue. Like allantoin, urea occurs in maggot excretions and its presence serves as a further elucidation of the remarkable efficiency of surgical maggots in healing chronic suppurating wounds.

"Urea, which is manufactured in enormous quantities for use as a soil fertilizer, is available for therepeutic use without any connection with animal excretions. It can be made from three simple gases, nitrogen, hydrogen, and carbon dioxide, and is a pure white crystalline substance. In wound treatment a 2-percent solution in water has been used on saturated gauze dressings applied directly to the wound. The solution is bland, odorless, and nontoxic. The treatment is very inexpensive and easily given.

"Urea is present in the cells of all the tissues of the body; it rapidly permeates the membranes of the cells and its concentration therein rises and falls readily with that of the blood and lymph. In view of the remarkable cleansing and healing properties of urea in chronic purulent wounds, it appears that the general conception of this material as only a waste product has tended to obscure its therapeutic character."

Buffered blood cultures, C. I. Nelson (*Jour. Bact., 32 (1936), No. 1, p. 121*).—The author has found the use of a buffer solution (McIlvaine's) composed of 1.83 cc of a 0.1 M citric acid solution combined with 18.17 cc of a 0.2 M

disodium phosphate and having a reaction of pH 7.4 to provide a medium for the culture of organisms in blood. Three to 5 cc of blood drawn aseptically into 10 cc of buffer solution lacks the inhibiting effect which often makes blood culturing ineffective. The blood does not clot. The blood serum constituents serve as nutrients.

"Cultures have easily been obtained of various streptococci, *Brucella abortus, Eberthella typhosa*, and other organisms associated with fever, as well as others of indeterminate function."

"Vitamin G" in coccidian infection, E. R. BECKER and N. F. MOREHOUSE (*Jour. Bact., 32 (1936), No. 1, pp. 121, 122*).—The authors have found that "the intestinal location and life cycle of Coccidia make oocyst counts an index to their multiplication. Quantitative data were based on counts by the dilution method subsequent to infection with uniform numbers of oocysts in reference and test series. The host was the rat; the parasite, *Eimeria miyairii*; the reference diet, a basal plus 10 percent powdered yeast. Oocyst counts from hosts on a ration deficient in vitamins B and G were about a fifth of the normals; from G-deficient hosts, a third of normal; B-deficient hosts, equal to normal. Liver extract equivalent to 4 g as a daily supplement to basal diet conditioned counts a third to fourth of normal; 2 percent powdered liver and 2.5 percent rice polish counts a seventh of normal; 10 percent powdered liver and 4 percent rice polish counts a third of normal. Only the last ration gave host growth equal to normal or reference series. Powdered skim milk as the sole source of vitamins B and G gave slight growth, but parasite counts were only a small fraction of normal. Liver and skim milk are either deficient in a coccidium accelerant or restrain their numerical increase by positive means."

The indol tolerance of certain strains of the colon-aerogenes group, R. L. FRANCE (*Jour. Bact., 32 (1936), No. 2, pp. 211–214*).—Contributing from the Massachusetts Experiment Station, the author reports upon a study of the indol tolerance of 173 strains of fecal type *Escherichia coli*, 155 strains of *Aerobacter aerogenes*, and 83 strains of "intermediates." The results indicate that these members are so similar in their tolerance for indol that no practical application can be made.

The fermentation reactions of Erysipelothrix rhusiopathiae, A. W. DEEM and C. L. WILLIAMS (*Jour. Bact., 32 (1936), No. 3, pp. 303–306*).—In the work with swine erysipelas reported, 37 strains of *E. rhusiopathiae* were used to determine the fermentation reactions of the species. Eleven of the strains originated in the United States, the others having been secured from European laboratories. A special sugar-free broth was prepared in which the organisms were grown readily. Only glucose, fructose, galactose, and lactose were fermented by all 37 strains. A slight acid reaction was detected in the cultures of some strains containing mannose, arabinose, and xylose. None of the other carbohydrates tested were fermented.

"No correlation was apparent between the source of the strains and their fermentation reactions. The uniformity of results demonstrates not only the biochemical activity of this bacterium, but also the reliability of sugar fermentation tests for the identification of this species and its differentiation from organisms of the *Corynebacterium* group with which it may be confused."

Specificity of the dye in the crystal-violet agar reaction of staphylococci, G. H. CHAPMAN (*Jour. Bact., 32 (1936), No. 2, pp. 199–205*).—Heavy inoculation was found necessary to secure growth of staphylococci on crystal violet agar. Solutions of crystal violet used for the preparation of crystal violet agar should be freshly prepared. The optimum dilution is between 1 : 300,000 and 1 : 350,000. Although representatives of the different groups of biological dyes were tested

with staphylococci, color changes similar to those produced on crystal violet media were obtained only with media prepared from dyes containing methyl, gentian, or crystal violet. It is concluded that the violet agar reaction of staphylococci is highly specific as far as the dye is concerned, and depends upon a reaction of growth products of staphylococci with either pentamethyl pararosaniline or hexamethyl pararosaniline.

Observations on the serology of streptococci of bovine origin, S. E. Hartsell and W. N. Plastridge (*Jour. Bact., 32 (1936), No. 1, pp. 126, 127*).—One hundred and twenty cultures that had been identified by the biochemical test as either *Streptococcus mastitidis* group A (Lancefield's group B) or group B or saprophytes were examined by the slide agglutination test and the precipitin test of Lancefield (E. S. R., 69, p. 581).

"In general, the three biochemical types were serologically distinct. Of 70 group A strains, 65 which were associated with other evidence of mastitis were divided into three serological types. Five group A cultures which failed to react with the three type serums were from samples from mastitis-free quarters. Of 23 group B cultures, 15 reacted with one of three types of group B antiserum. Of 17 cultures classed as saprophytes by biochemical tests, 11 reacted with one of three types of antiserum against saprophytic organisms, and 6 failed to react with any serum. Ten cultures which reduced methylene blue milk (1:5,000), but otherwise resembled group A biochemically, were associated with other evidence of mastitis; they reacted with group A antiserums. Members of group A which fermented salicin were identical serologically with those which failed to do so. Strongly hemolytic sorbitol-fermenting cultures which reacted with our group A antiserums were observed in one instance."

Source of the organisms associated with sub-clinical mastitis (*New York State Sta. Rpt. 1936, pp. 24, 25*).—The work of the year (E. S. R., 74, p. 853) is briefly referred to.

A preliminary note of the life history of Schistosoma turkestanicum Skrjabin 1913, C. MacHattie (*Vet. Jour., 92 (1936), No. 8, pp. 291–299, pls. 4*).—*S. turkestanicum* was found to be "a formidable and dangerous parasite of domestic animals in the Marsh-Arab and rice field areas of Iraq. In addition to cattle, sheep, goats, and water buffaloes, it has been proved that camels, horses, donkeys, and mules are also hosts. The arrest of the egg in the intestinal mucosa and the consequent formation of nodules largely destroys the value of the intestine as a commercial product. Man and domestic and wild birds are apparently immune to infection despite continuous exposure to the attacks of the cercariae of *S. turkestanicum*. The snail host of *S. turkestanicum* is *Limnea tenera euphratica* Mousson ('phase' *Angustior* Mousson). Cercariae of *S. turkestanicum* become very sluggish toward the end of the hot season (late September) and disappear from October to May. It seems probable that livestock can then drink from infected ponds with comparative impunity."

The spread of tularemia through water, as a new factor in its epidemiology, S. P. Karpoff and N. I. Antonoff (*Jour. Bact., 32 (1936), No. 3, pp. 243–258*).—Observations conducted by the epidemiological section of the Institute of Epidemiology and Microbiology at Tomsk, Siberia, of the spread of tularemia through water are reported upon.

It is pointed out that while in the United States the wild rabbit is the principal source of tularemic infection in man, the water rat is the principal source in the Union of Soviet Socialist Republics. Other hosts of the infection are listed. The spread of the infection by water was proved experimentally and bacteriologically. "The quantity of micro-organisms in the infected water courses may sometimes be so considerable that their isolation

does not meet with great difficulties. In our experiments 100 percent of the guinea pigs infected with the water died and their organs showed characteristic pathological-anatomical changes. From the organs of all these guinea pigs by water we obtained cultures of *B[acterium] tularense*."

Results of administering two calfhood injections of a living Brucella abortus culture to prevent Bang's disease, A. L. DELEZ (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 1, pp. 61–65*).—In summarizing the results of work at the Indiana Experiment Station, conducted in an attempt to increase their resistance, the author reports that eight heifer calves that had received two subcutaneous calfhood injections of a living *B. abortus* culture dropped living calves. "Two calves died shortly following delivery. *B. abortus* infection was recovered from five heifers. Serum agglutination titers subsequent to the administration of two injections were higher than when only one injection was given. The titers dropped considerably 4 mo. following the second injection. A study of the opsonocytophagic activity of the blood following parturition revealed only a slight degree of phagocytosis in most cases."

Oat hay poisoning, I. E. NEWSOM, E. N. STOUT, F. THORP, JR., C. W. BARBER, and A. H. GROTH (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 1, pp. 66–75*).—Several serious losses of cattle feeding on oat hay are described in this contribution from the Colorado Experiment Station. The symptoms were suggestive of poisoning by hydrocyanic acid, but no cyanide had been found in the hay except in cane, which in most of the outbreaks was not even under suspicion. Pigweed, while almost always a contaminant of oat hay, produced no symptoms in sheep, rabbits, or guinea pigs when fed experimentally. "By feeding the original hay the disease was apparently reproduced in five of the steers, causing death in three. Two of the three showed the presence of hydrocyanic acid in the rumen by means of the sodium picrate paper test some hours after death. No injurious substance could be shown to be present in the hay or any of its constituents when fed to sheep, rabbits, or guinea pigs. Watery, alcoholic, and ether extracts were harmless to laboratory animals."

The pathogenesis of ketosis: Pregnancy disease of sheep, L. M. RODERICK, G. S. HARSHFIELD, and M. C. HAWN (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 1, pp. 41–49*).—In continuing their studies at the North Dakota Experiment Station (E. S. R., 70, p. 833) the authors have found that the pregnancy disease problem is quite definitely related to carbohydrate metabolism. "With an inadequate carbohydrate intake, the glycogen is withdrawn from the liver to maintain the blood sugar level in metabolism and fat takes its place. While the increased excretory burden associated with pregnancy may provoke some liver injury, the fatty changes in the liver and kidney are readily produced by starvation and an inadequate nutritional intake. There are unpublished experimental data to show that the newborn lamb is provided with a reserve of glycogen in its liver. The fetal lamb liver is storing glycogen for some days prior to parturition, providing the ewe is adequately fed. As high as 9 percent of glycogen has been found in the livers of these lambs, which is two or three times as much as in the liver of the ewe. The demands of a twin pregnancy are thus apparent." The experimental work is considered to have demonstrated "the part that semistarvation and inadequate feed play in the causation of the disease. The nutrition of ewes should be such that their condition improves with advancing pregnancy. The animal body has a greater reserve of fat and protein than of carbohydrate. The use of a liberal and balanced ration is needed, yet the use of molasses to supplement roughages of low quality seems justified on fundamental principles."

A disease of horses caused by feeding moldy corn, L. H. Schwarte, H. E. Biester, and C. Murray (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 1, pp. 76–85, figs. 7*).—Studies of a disease of horses, involving especially the central nervous system and caused by the ingestion of moldy corn, are reported upon, the work having been supported in part by grants from the Iowa Experiment Station and the Rockefeller Fluid Research Fund.

"Three of the five horses experimentally fed moldy corn died, while two were destroyed, one of which was in a moribund condition and the other showed marked intoxication and severe incoordination. These subjects presented gross and histologic evidence in the brain and spinal cord distinguishable from the specific virus disease. Bacterial cultures made from the brain and other organs were negative. Intracerebral inoculations into guinea pigs were likewise unsuccessful. This condition is not associated with the specific virus encephalomyelitis.

"In Iowa, moldy corn poisoning occurs usually from November until May, during which time the virus disease has subsided. It is possible, however, to have an overlapping in the occurrence of these two diseases in October and November, depending upon the temperature and rainfall affecting the development of the corn. The specific virus encephalomyelitis of horses is seldom encountered after the first killing frosts. The perivascular cuffing and neuronophagy were never present in either field cases or those produced experimentally by feeding moldy corn. The moldy corn disease is always associated with necrosis, edema, advanced hemorrhagic lesions, and degenerative processes. The two diseases were clearly differentiated on histologic evidence alone.

"The term 'moldy corn poisoning' should be used provisionally to designate this disease until the organism or group of organisms which are responsible for this action on the corn are isolated and their ability to produce these toxins demonstrated. There are a number of organisms present in moldy corn. Some are recognized as plant pathogens and others are not. Close cooperation with plant mycologists is necessary to determine the factors involved. None of these organisms which are found on moldy corn invades the animal body beyond the digestive tract. The term 'cornstalk poisoning' is not well chosen, as there is considerable evidence to show that the toxic agent is present in the kernels and possibly in the cobs as well. Because of the varied clinical pictures seen as the result of moldy corn poisoning, we do not feel justified in differentiating it clinically from the virus disease. The clinical symptoms and course of the disease depend largely on the extent and the part of the central nervous system which is involved. The history of the case and the clinical manifestations, together with the gross and histologic changes, should make it possible to differentiate moldy corn poisoning from the specific virus encephalomyelitis in horses."

Observations on canine babesiasis (piroplasmosis), D. A. Sanders (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 1, pp. 27–38, figs. 9*).—Contributing from the Florida Experiment Station, the author reports upon a chronic form of babesiasis due to *Babesia canis* that has been encountered in various breeds of dogs in widely separated locations in Florida, in which State the first case was observed by P. Eaton [1] at Jacksonville in 1934. "The training and coursing activities of affected greyhounds are seriously interrupted. The brown dog tick, *R[hipicephalus] sanguineus*, is suspected as being the principal vector of the infection. The presence of chronic canine babesiasis as encountered was

[1] Jour. Parasitol., 20 (1934), No. 5, pp. 312, 313.

determined by blood inoculations and splenectomies of test animals. Young pups splenectomized during or shortly following clinical reactions usually succumb within [from] 24 to 48 hr. as a result of severe relapse associated with numerous *B. canis* in the blood. Pups in a state of relative immunity or premunized to *B. canis* did not react to intraperitoneal injections of blood from dogs showing symptoms of malignant jaundice, while nonimmune pups reacted to such injections showing *B. canis* in the blood."

Types of fox encephalitis virus, R. G. GREEN (*Jour. Bact.*, *32* (*1936*), *No. 1*, *pp. 119, 120*).—In groups of foxes passively immunized by a serum made from the fox encephalitis virus a mild type of the disease has been observed to develop showing a mortality of about 1 percent. Under experimental conditions this virus produces a mortality of only 20 percent, but with endothelial cell inclusions typical of encephalitis. Subsequent observations have indicated that this new type of virus is immunologically distinct from the type originally described. The original virulent virus is now referred to as type A; the newly recognized virus of low virulence is described as type B fox encephalitis virus.

Purification of fox encephalitis virus by tryptic digestion, R. G. GREEN (*Jour. Bact.*, *32* (*1936*), *No. 1*, *p. 120*).—In work with the fox encephalitis virus smears made from the ependyma of foxes inoculated by cisterna puncture were stained to show the presence of the intranuclear inclusions of fox encephalitis. "A suspension of ependymal scrapings containing inclusion bodies was digested by the use of trypsin and enterokinase. Definite clearing of the suspension was noted, and cellular material could not be demonstrated by stained smears after digestion. Upon centrifuging, a sediment was obtained which was resuspended in distilled water. Ten similar washings were performed, using 10 cc of liquid for each washing. Finally, suspended in saline solution, the sediment produced typical fox encephalitis when injected into foxes by cisterna puncture, although a low concentration of the virus was indicated. This procedure demonstrates the resistance of the virus to tryptic digestion and its occurrence under these conditions in fairly large masses capable of ordinary centrifugation."

A six-point general sanitation program for poulty, P. W. ALLEN (*Poultry Sci.*, *15* (*1936*), *No. 5*, *pp. 414, 415*).—Poultry sanitation investigations conducted by the Tennessee Experiment Station during the last 6 yr. have led the author to emphasize the importance of several factors, namely, the freedom of poultry from contact with disease-producing microbes and parasites, supply of fresh water and fresh feed free from contamination, use of litter in clean houses, and the prevention of contact with infected or infested fowls.

Studies on incubator hygiene, VI–VIII, R. GRAHAM and V. M. MICHAEL (*Poultry Sci.*, *15* (*1936*), *No. 6*, *pp. 490–495*).—The continuation of this contribution (E. S. R., 75, p. 260) is presented in three parts.

VI. *A note on the resistance of S*[*almonella*] *pullorum on sterilized and unsterilized egg shells* (pp. 490, 491).—In three separate fumigations of a forced-draft incubator (formaldehyde released from cheesecloth 20 cc per 100 cu. ft.), "there appeared to be very little variance in the longevity of *S. pullorum* on eggshells which had been sterilized at 15 lb. steam pressure for 30 min. and for those which had not been sterilized previous to contamination with *S. pullorum*. *S. pullorum* on eggshells in hatching trays survived formaldehyde fumigation for 30 min. After 40 min., *S. pullorum* was generally nonviable, although in one fumigation it survived for 100 min. on sterilized eggshells. The survival of *S. pullorum* on eggshells during formaldehyde fumigation of a forced-draft incubator for 100 min. suggests the advisability of keeping the incubator closed for at least 2 hr. following fumigation. The range of

S. pullorum viability in empty incubators, as previously reported (E. S. R., 70, p. 835), appears comparable to the results of these experiments in which a 32,000 capacity incubator carried 6,000, 15,000, and 20,000 eggs. In 25 separate fumigations, however, *S. pullorum* that occasionally survived 40-min. fumigation may have had a range of 100 min."

VII. *Results of fumigation of S. pullorum in incubators at full capacity* (pp. 492, 493).—The studies reported have shown "that formaldehyde fumigation is probably as effective in destroying *S. pullorum* in a forced-draft incubator operated at 50 or 60 percent egg capacity as in an incubator that is practically empty, since the average survivability of *S. pullorum* and range survivability proved comparable. In one instance *S. pullorum* survived for 150 min. in the lower door and 120 min. in the upper door, and proved non-viable at 180 and 150 min., respectively."

VIII. *The resistance of S. aertrycke, S. anatum, and Salmonella from quail to formaldehyde fumigation* (pp. 494, 495).—In the fumigation work reported, *S. aertrycke* and *S. newport* on cotton squares survived formaldehyde fumigation in a forced-draft incubator for 30 min. but was not viable at 60 min., while the quail *Salmonella* survived for 60 min. but was not viable at 90 min.

[The use of anthelmintics for the control of avian parasites] (*Arkansas Sta. Bul. 337 (1936), pp. 40–42*).—The work of the year (E. S. R., 74, p. 857), by W. L. Bleecker and R. M. Smith, is briefly noted.

Studies in coccidiosis in chickens: Calcium carbonate additions and coccidia, C. E. Holmes, C. A. Herrick, and G. L. Ott (*Poultry Sci., 15 (1936), No. 5, pp. 416, 417*).—In the further study of coccidiosis (E. S. R., 76, pp. 107, 251) at the Wisconsin Experiment Station, Single Comb White Leghorn chicks were brooded in sterile cages, fed sterilized rations, and reared under conditions that made infection impossible. "Zero, 3, and 6 percent of chick size oystershell was added to the rations of the three groups in each trial, and controlled infections of coccidiosis were made at three different ages. Infection was accomplished by pipette feeding of measured amounts of sporulated oocysts of a pure culture of *Eimeria tenella*. These trials seem to indicate that excessive mineral additions are likely to be detrimental to growing chicks if the chicks become infected with coccidiosis."

Cultivation of the virus of infectious bronchitis, F. R. Beaudette and C. B. Hudson (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 1, pp. 51–58*).—Studies by the New Jersey Experiment Stations of a respiratory disease of chicks, encountered in January 1935 in a broiler plant having a total population of about 40,000 of all ages, are reported upon. A review of the literature is said to have shown that the affection is undoubtedly the same as that reported upon by Schalk and Hawn in 1931 (E. S. R., 65, p. 271) in North Dakota, Bushnell and Brandly in 1933 (E. S. R., 68, p. 820) in Kansas, and Beach and Schalm in 1936 (E. S. R., 76, p. 106) in California, for which, to distinguish it from laryngotracheitis, the name infectious bronchitis has been recommended (E. S. R., 76, p. 396). It was found that when introduced intratracheally and intranasally the virus, which passes all grades of Berkefeld filters, regularly provokes the disease. "Subcutaneous and intramuscular inoculations are either noninfective or else produce the disease after a prolonged incubation period. Inoculated into the chorioallantoic membrane of the developing embryo, the virus does not produce gross lesions such as are produced by the viruses of laryngotracheitis, fowl pox, and pigeon pox. The absence of such lesions could be used to distinguish between the viruses of laryngotracheitis and bronchitis. After a few passages, the virus developed the capacity to kill the embryo. The embryo appears smaller than embryos of the same age from eggs in which pox and laryngotracheitis viruses have been cultivated. After passage through 14

generations, the virus was infectious for chickens that were immune to laryngotracheitis. Likewise, birds recovered from bronchitis were still susceptible to laryngotracheitis. The serum of birds recovered from bronchitis is capable of neutralizing the virus."

Studies of the clinical manifestations and transmissibility of infectious coryza of chickens, J. R. BEACH and O. W. SCHALM (*Poultry Sci.*, *15* (*1936*), *No. 6, pp. 466–472, figs. 3; abs. in No. 5, p. 416*).—In further work at the California Experiment Station (E. S. R., 75, p. 110; 76 p. 106), "infectious coryza was found to occur as a simple coryza manifested only by a nasal discharge or as a coryza with complications consisting of edematous swelling of the face, sinusitis, conjunctivitis, tracheitis, bronchitis, and infection of the air sacs. The disease was easily transmitted by inoculation of normal chickens with exudative material from any infected part or by direct contact exposure of healthy fowls to diseased ones. Transmission of the disease by indirect contact was accomplished but did not take place readily. Cages contaminated by occupancy by diseased chickens and by having virulent exudate from infected chickens placed in the feed and water vessels did not remain infective to susceptible chickens placed in them for longer than 24 hr. The disease was transmitted by inoculating healthy chickens with scrapings of the nasal mucosa of chickens which had been infected with coryza but had shown no symptoms for as long as 46 days. Pigeons were found to be refractory to the disease. Three turkeys which were tested were found to be susceptible, and the resultant disease was of the same character as natural cases of coryza and sinusitis in this species of bird."

Studies of infectious coryza of chickens, with special reference to its etiology, O. W. SCHALM and J. R. BEACH (*Poultry Sci.*, *15* (*1936*), *No. 6, pp. 473–482, figs. 6; abs. in No. 5, p. 416*).—In a continuation of the work at the California Experiment Station on the etiology of infectious coryza (E. S. R., 76, p. 106), transfer at intervals of less than 14 days was found necessary for the maintenance of slant or plate cultures of *Hemophilus gallinarum*. Stock cultures were maintained indefinitely by making transplants once a week. It is concluded that "the minimum temperature at which *H. gallinarum* will grow in culture is 25° C., the maximum temperature is 45°, and the optimum temperature range is from 34° to 42°.

"The injection of pure cultures of *H. gallinarum* into the respiratory tract of fowls produces a coryza with symptoms identical with those of the natural or exudate-induced disease but of much shorter duration. Attempts to determine whether the longer duration of the natural or the exudate-induced disease was due to the presence in the exudate of types of bacteria other than *H. gallinarum* or of a filtrable virus yielded negative results. A mild culture-induced coryza of only 2 days' duration, by rapid serial passage through chickens, increased in virulence and severity until it was of the same character as that produced by exudate obtained from severe field cases. This increase in virulence and severity occurred without the introduction of any pathogenic agent other than the culture *H. gallinarum* with which the series of passages was initiated. The results are regarded as evidence that the mild character of the culture-induced disease is due to a decrease in virulence of the organism on artificial media, and that the virulence can be restored by continued cultivation in the more favorable environment of the nasal passages of susceptible chickens."

Differentiation of paralysis in chicks, E. JUNGHERR (*Poultry Sci.*, *15* (*1936*), *No. 5, pp. 415, 416*).—In this further contribution from the [Connecticut] Storrs Experiment Station on paralysis (E. S. R., 73, p. 109), differentiation by histologic means is considered. Chicks sacrificed for examination and found

to be free from demonstrable bacterial or parasitic diseases served as the source of tissue material. The results are summarized in a table. Of the conditions listed, namely, gout, crazy chicks, A avitaminosis, G avitaminosis, epidemic tremor, neurolymphomatosis, and field encephalomalacia, all except field encephalomalacia have been described in the literature. Although the true cause of gout is regarded as unknown, the work of other investigators and the author's observations indicate that sodium bicarbonate can cause a disease indistinguishable from it. It is pointed out that the term "crazy chick", popularly applied to various conditions, should be restricted to the nephritic ataxia described by Dunlap (E. S. R., 67, p. 748), it being rarely found if histologic changes in freshly killed chicks are used as the diagnostic criterion. The hitherto undescribed field encephalomalacia of unknown etiology was the most interesting condition encountered. Well-grown birds between 3 and 7 weeks showed droopiness, retraction of head or trembling of legs, and, at autopsy, characteristic gross affection of the brain by edema and cerebellar hemorrhages. The condition resembles in gross and histopathologic features the nutritional encephalomalacia of Pappenheimer and Goettsch (E. S. R., 69, p. 719), but seems to differ in occurring on feeds, presumably containing the antiencephalomalytic factor, and in being influenced therapeutically by methylene blue instead of vegetable oils.

Serological types of Salmonella isolated from paratyphoid in chicks, E. JUNGHERR and A. G. BORDEN (*Jour. Bact., 32 (1936), No. 1, p. 127*).—During the routine diagnosis of chick diseases at the [Connecticut] Storrs Experiment Station five cases of paratyphoid infection were observed in 1935 and 1936, although no cases had been diagnosed during the preceding 4 yr. Paratyphoid-like organisms were isolated from several chicks of each specimen lot and recognized as the etiological agents. Biochemical tests placed these organisms in the genus *Salmonella*. Strains determined to be smooth variants on the basis of morphology, colonial characteristics, boiling, salt sensitivity, and Pampana tests were subjected to serological analysis by the Kauffmann-White scheme (E. S. R., 72, p. 534). Two of the organisms were found to resemble the one recently isolated by Jungherr and Wilcox (E. S. R., 73, p. 110) and by Edwards (E. S. R., 74, p. 548). "These organisms belong to group B and are now known as *S. typhi-murium* var. *storrs*. Two of the isolated organisms were shown to belong to group C, resembling *S. cholerae suis* in the specific phase, and one strain was found to belong to group E, resembling *S. london*. The group C organisms differed from true *suipestifer* strains in fermenting arabinose, and the group E culture differed from *S. london* in failing to ferment inositol. The group E organism was able to absorb all antigenic factors from a known *S. london* serum and vice versa, but further tests are necessary to establish identity."

The occurrence of Salmonella, Oranienburg type, in an infection of quail, P. R. EDWARDS (*Jour. Bact., 32 (1936), No. 3, pp. 259–263*).—In work at the Kentucky Experiment Station the author identified an organism occurring in an epizootic among baby quail, resulting in the death of large numbers on the State quail farm in Illinois, as *Salmonella*, type Oranienburg. It is said to constitute the first recognized occurrence of this type in diseases of animals.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Department of Agriculture, 1936] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1936, pp. 95–98, 113–115*).—Progress results are briefly presented of investigations on improved farm equipment, potato storage, irrigation and snow surveying, and road construction.

Report of the Chief of the Soil Conservation Service, 1936, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1936, pp. 52*).—This report presents the progress results of the work of the Soil Conservation Service during 1936, with particular reference to field and conservation operations, research, and cooperative relationships. The research program related to six closely coordinated lines of investigation in the factors involved in soil and water conservation and was organized to be cooperative with the State agricultural experiment stations.

[**Agricultural engineering investigations by the Arkansas Station**], D. G. CARTER, R. P. BARTHOLOMEW, L. C. KAPP, W. C. HULBURT, and R. M. SMITH (*Arkansas Sta. Bul. 337 (1936), pp. 12, 13, 26, 27, 40*).—Progress results are briefly presented of investigations on farmhouse planning and design, durability of posts and methods of preservative treatment, water resources for rice irrigation, cost of terracing, erosion control, and poultry housing.

[**Agricultural engineering investigations by the Michigan Station**] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 5, 6*).—Progress results are briefly presented of investigations on low cost paints and surface treatments, lime-treated shavings and sawdust for insulation, the use of a stem crusher as an aid in curing leguminous hay, designing a universal type cultivator, and the conversion tractor.

[**Agricultural engineering investigations by the Missouri Station**], J. C. WOOLEY, M. M. JONES, and G. W. GILES (*Missouri Sta. Bul. 370 (1936), pp. 27, 28, fig. 1*).—The progress results are briefly presented of investigations on poultry houses, terrace outlet structures, and the economy of various tillage methods for the growing of corn in Missouri.

[**Agricultural engineering investigations at the Montana Station**] (*Montana Sta. Rpt. 1935, pp. 28, 29, 47, 48, figs. 2*).—Progress results are briefly presented of investigations on the development of water reservoirs on the range and of a homemade double intake centrifugal pump for irrigation.

A selected bibliography on upstream engineering (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, pp. [2]+6*).—This mimeographed bibliography, prepared for the Upstream Engineering Conference (E. S. R., 75, p. 577), contains about 70 references to literature on the subject.

Forest and agricultural influences in streamflow and erosion control, W. C. LOWDERMILK (*U. S. Dept. Agr., Soil Conserv. Serv., [1936], pp. [1]+37+4, fig. 1*).—This is a mimeographed summary review of literature up to 1930, the purpose of which is to set forth briefly the status of conclusions of investigators who have studied the problem and of experimental information on the subject as found in European and American literature.

Soil erosion and its control, Q. C. AYRES (*New York and London: McGraw-Hill Book Co., 1936, pp. XI+365, figs. 244*).—This is a general treatise on the subject of erosion control, in which an attempt is made to bring together a general introduction to and correlation of all phases of the problem with the quantitative application of such data as are known at present. The author points out that the apparent disproportionate emphasis accorded to engineering phases of erosion control is partly attributable to the fact that more information of a practical and time-tested nature is available from that standpoint. Chapters are included on factors affecting rate of erosion, methods of control, rainfall and run-off, terrace design, terrace location—principles and practice, terrace construction methods and machinery, terrace construction costs and maintenance, terrace outlets, control of gullies, temporary and semipermanent check dams, permanent or soil-saving dams, special uses of vegetation, and soil conservation and land use. An appendix deals with simple methods of calculating

land areas, partial lists of soil conserving and depleting crops and of plants favorable to soil conservation and wild life, and other data.

Public Roads, [December 1936] (*U. S. Dept. Agr., Public Roads, 17 (1936), No. 10, pp. [2]+223-248+[1], figs. 13*).—This number of this periodical contains data on the status of various highway projects receiving Federal funds as of November 30, 1936, data on the disposition of State motor fuel, motor vehicle, and motor carrier receipts and receipts from State imposts on highway users, 1935, and an article entitled Determination of Coefficients of Friction of Sliding Bearings for Bridges, by G. W. Davis (pp. 223-237).

Procedure for making soil conservation surveys.—Outline No. 4, approved by G. L. Fuller (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, Outline 4, pp. III+32*).—Instructions are presented for use in making soil conservation surveys, including surveys on Soil Conservation Service projects. The instructions relate to base maps, symbols, differentiation of the four major land classification factors for conservation surveys, and reports.

Model traffic ordinances (*U. S. Dept. Agr., Public Roads, 1936, pp. VIII+30*).—These ordinances, presented as revised and approved by the Fourth National Conference on Street and Highway Safety, May 23-25, 1934, consist of part 1, a model municipal traffic ordinance; part 2, a model traffic administrative ordinance; and part 3, State law provisions which might be included in the traffic ordinances.

The corrosion of cement.—I, Portland cement and water, E. B. R. Prideaux and B. G. Limmer (*Jour. Soc. Chem. Indus., Trans., 54 (1935), No. 42, pp. 348T-354T, figs. 5*).—Studies are reported in which conductivities and hydroxyl-ion concentrations (as pH by the hydrogen electrode) were used to determine the concentrations of calcium hydroxide dissolved from the pure solid as a standard. The solubility of pure lime obtained by these methods and potentiometric titration was found to be in good agreement with results of previous workers. The conductivity method thus standardized was found to be the more delicate in following slight changes of concentration. These methods were then applied to an investigation of the corrosion of portland cement by pure water, it having been found that the presence of aluminates and calcium sulfate dissolved from the cement had relatively slight effects. Cylinders of neat cement were extracted with water under various conditions, and figures were obtained for the amounts of lime removed per unit surface of cement and volume of solution. For the same times these amounts increase with increase in the ratios surface of cement : volume of solution. The initial effect of an inert aggregate on rate of corrosion was negligible, but in the later stages this rate was lower for a concrete than for a neat cement. Rates of removal of lime and concentrations of extracts were compared in the cases of pats and powders, respectively. About a quarter of the weight of powdered cement was removed by successive extractions with water. The most important factor governing the percentage dissolved is the ratio of volume of water : surface of cement. The rate of corrosion of massive pieces in the early stages resembles the rate of dissolution of a pure substance, but in the later stages it appears to be more determined by rate of diffusion of lime through the surface of the solid. A typical hard water was found to remove more lime than pure water under the same conditions, and the (sulfate) hardness of the water was thereby reduced.

The calorific value of decayed cordwood, M. T. Hilborn (*Phytopathology, 26 (1936), No. 9, pp. 905-914, fig. 1*).—In studies conducted at the Maine Experiment Station, the effect of decay on specific gravity and calorific value was measured in split and unsplit wood of red maple, paper birch, and beech in two types of situations over a period of 4 yr.

Specific gravity of the wood when air dried was found to be higher in split wood, presumably from trunks, than unsplit wood, presumably from branches. As the specific gravity decreased the calorific value of the wood, air-dried, also decreased somewhat, indicating a change in chemical composition. The calorific value decreased somewhat faster in the woods than in an open field, faster in the split than in the unsplit form, and respectively more rapidly for the maple, beech, and birch in the round form. Correcting the calorific value for water content, which increased with decay, the net, or practically useful fuel value was found to decrease in 4 yr. as much as 89.4 percent for the round white birch from the woods, and as little as 35.9 percent for the round red maple from the open field. The decrease was as much as 50 percent in less than 2 yr. in some of the birch wood.

Effect of tetraethyllead on preflame reactions in an engine, L. Withrow and G. M. Rassweiler (*Indus. and Engin. Chem., 27 (1935), No. 8, pp. 872–879, figs. 6*).—Studies conducted by the General Motors Research Division are reported. Absorption spectra of the gaseous charge in an engine indicate that when tetraethyl lead is added to the fuel to prevent knock there is an effect on the preflame reactions in that portion of the charge which, in the absence of tetraethyl lead, suddenly inflames at the time of knock. Atomic lead has been identified in the noninflamed charge in the knocking zone at the moment that antiknock action is being effected, but no accompanying absorption by lead monoxide has been observed. When lead is vaporized in a hot nichrome tube the absorption spectra exhibit lead monoxide bands at lower temperatures than atomic lead lines. Comparison of experiments in and out of the engine indicates that lead monoxide is being reduced in the noninflamed charge.

Using water in tractor tires to increase drawbar pull (*Impl. and Tractor, 51 (1936), No. 20, p. 30*).—Investigations are reported which indicate that the use of water within tractor tires is entirely satisfactory for additional weight requirements in field service. In describing the equipment required to induce water under pressure, it is pointed out that water under 50 lb. pressure will flow through the connections and the valve stem at the rate of about 20 lb. per minute. The use of water-filled tires in temperatures low enough to cause the formation of hard ice necessitates the use of antifreeze solutions.

A telescoping wagon tongue, C. K. Shedd and E. V. Collins (*Agr. Engin., 17 (1936), No. 8, pp. 343–345, figs. 4*).—In connection with the studies of corn production machinery at the Iowa Experiment Station, a telescoping wagon tongue was developed which is here described and illustrated. Working drawings also are included. This work was done in cooperation with the U. S. D. A. Bureau of Agricultural Engineering.

Unit heaters in greenhouses, A. H. Senner (*Agr. Engin., 17 (1936), No. 8, pp. 333–336, 340, figs. 8*).—Studies conducted by the U. S. D. A. Bureau of Agricultural Engineering are reported, the objects of which were (1) to determine the relative steam consumption of unit heaters and conventional pipe coils for heating a greenhouse; (2) to compare the distribution of temperature with the two types of heating; and (3) to determine the relative quantities of steam required during the daylight and night periods, respectively, and to arrive at a knowledge of the steam consumption per degree-day per 1,000 sq. ft. of equivalent glass area. The data are presented mainly in graphic form.

A striking result of the study was the fact that more uniform temperature distribution was maintained throughout the experimental greenhouse by means of coils than by unit heaters. From actual measurements taken during the study it was possible to establish certain constants. It was found, for example, that 20 lb. of steam are required per 1,000 sq. ft. of glass or equivalent per

degree-day in heating a greenhouse such as the one under test and located in those regions which have solar heating characteristics.

Equipment for applying dust fungicides to seed grain, W. M. Hurst, F. D. Fulton, W. R. Humphries, and R. W. Leukel (*U. S. Dept. Agr. Circ. 415* (*1936*), *pp. 20, figs. 12*).—The equipment described includes commercial treaters and experimental feeders. General precautions for handling fungicides are included.

Engineering phases of pink bollworm control, D. A. Isler (*Agr. Engin., 17* (*1936*), *No. 8, pp. 346–348, figs. 6*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering, it is pointed out that the engineering phases of present investigations for effective field control of the pink bollworm include (1) development of mechanical equipment for the destruction of worms in the crop remnants, and (2) determining the value of plowing, irrigation, and other cultural practices as control measures.

Application of sulfuric acid for weed control, O. C. French (*Agr. Engin., 17* (*1936*), *No. 8, pp. 339, 340, figs. 4*).—In a brief contribution from the California Experiment Station, the results of tests of the mechanical application of sulfuric acid for weed control are presented. In tests on barley fields infested with wild mustard an average increased yield of 50 percent was obtained by treating with a 10-percent solution of sulfuric acid.

The experiments resulted in the development of a sprayer of the portable power take-off type. This unit was equipped with a 20-gal.-per-minute pump and a 400-gal metal tank, and was mounted on dual pneumatic tires. On the rear of this sprayer a frame was built that held a 50-gal. drum of concentrated acid and also supported an 18-ft. folding boom. A ⅜-in. Penberthy steam ejector was installed in the water discharge line from the pump, just ahead of the spray boom. Water flowing through this ejector under 250 lb. pressure reduced the pressure in the suction side of the ejector sufficiently to draw concentrated acid from the drum.

Nozzles were developed that gave a flat fan-shaped spray. These were placed on the boom 12 in. apart so that when the boom was about 24 in. from the ground the fans overlapped, thus giving a double coverage. Nozzles were alternately tilted so that the spray was directed both forward and backward.

Some fundamental principles of drying, E. A. Fisher (*Jour. Soc. Chem. Indus., Trans., 54* (*1935*), *No. 42, pp. 343T–348T, fig. 1*).—This is a technical discussion of basic principles involved in the process of commodity drying.

Modern drying machinery, T. J. Horgan (*Jour. Soc. Chem. Indus., Chem. and Indus., 54* (*1935*), *No. 42, pp. 918–924, figs. 11*).—This is a technical description of modern drying methods and equipment.

Hop curing (*Rural Electrif. and Electro-Farming, 12* (*1936*), *No. 137, pp. 95–97, fig. 1*).—A brief discussion of the essential factors involved in the process of hop drying is presented, indicating the advantages presented by the use of electrical equipment.

The dehydration of farm products, F. E. Price (*Agr. Engin., 17* (*1936*), *No. 10, pp. 435–437, figs. 3*).—In a brief contribution from the Oregon Experiment Station, the status of artificial dehydration studies at the station is briefly presented, with particular reference to the work with corn and hops.

In a few tests with corn, the amounts of fuel required to reduce the moisture content of green corn from 30 to 12 percent per ton were 15 gal. of fuel oil, 0.14 unit of sawdust, 0.1 cord of fir wood, or 0.09 ton of coal.

Natural drying of forage crops, T. N. Jones and L. O. Palmer (*Agr. Engin., 17* (*1936*), *No. 10, pp. 433, 434, 437, figs. 2*).—This is a brief statement of the status of the studies at the Mississippi Experiment Station on the natural

drying of forage crops, with particular reference to the natural drying forces which respond to engineering control. A machine combining a mower and crusher is described which was developed in the course of these studies.

Grass drying (*Rural Electrif. and Electro-Farming, 12 (1936), No. 137, pp. 92–94, figs. 2*).—A process of hay drying which is in use in England and the corresponding equipment are described and details of cost involved presented. The drier is so arranged that grass may be dried in two successive stages by a current of hot air drawn upward through 24-in. beds of grass by means of an electrically driven fan. The grass is laid on trays, placed side by side in drying chambers connected by air passages, and held in position by weighted steel hurdles. During a 25-min. cycle, one tray of grass is partly dried, and the other tray of grass, which has been previously partly dried, is completely dried. When drying is complete, as shown by a thermometer, the dried grass is transferred to the baler and a fresh charge is prepared. Except for short intervals, when the trays are exchanged, drying is continuous. Coke or anthracite coal is burned in a steel chamber lined with firebricks to provide the necessary hot air for drying.

Moisture content at which alfalfa leaves shatter, F. J. Zink (*Agr. Engin., 17 (1936), No. 8, pp. 329, 330, figs. 4*).—Studies conducted at the Kansas Experiment Station in connection with research on the development of hay drying methods and equipment are briefly reported. The general procedure of the tests involved studies of periodic samples of hay as it dried normally in the swath. The results indicate that as alfalfa hay approaches 30 percent moisture there is considerable danger of losing the leaves.

It is concluded that shattering occurs before the hay is sufficiently dry for storage, indicating the possibility of night, evening, or morning operations as a means of securing improved quality. Where hay is dried artificially it appears possible to permit it to remain in the field without loss of dry matter until an average moisture content of around 40 percent is reached, thereby effecting considerable fuel economy.

Storing chopped alfalfa hay in ventilated containers, B. H. Roche (*Amer. Soc. Anim. Prod. Proc., 1935, pp. 259–262*).—This is a brief presentation of results of experiments conducted at the Wisconsin Experiment Station.

It was found that chopping hay at the time of storing in the barn or in ventilated containers has many advantages. The investigations were conducted with six wooden bins on a weighing track. These bins varied from 3 to 6 ft. wide, 7 to 8 ft. long on the inside, and 10 ft. deep, and a larger bin was 9 ft. wide, 15 ft. long, and 12 ft. deep. The side and end walls were double with 1" by 2" slats spaced 1 in. apart making up the inside wall, while the outer wall was of matched boards. There was an air space of 6 in. between the walls with openings to the outside at all four corners, allowing free movement of air between the slatted and the solid walls. The floor was tight. In addition to the wooden units, an all metal unit (with the exception of the floor and end sections which were wood) was used. This provided a double-walled container comparable to some commercial chopped hay storage structures. It was made of galvanized steel sheets with louvres (perforations) on the inside wall next to the hay and tight metal sheets for the outside walls. The design of the two metal walls was such as to permit a vertical movement of the air, carrying upward the heat produced in the hay in much the same manner as a chimney.

Chopped alfalfa, both first and second crop, of varying moisture content, was stored in each of the different containers. The hay was run through a silage cutter set on the ⅜-, ½-, or 1-in. cut.

With the equipment and length of cut used, it was concluded that in order to retain the maximum nutritive value the hay must be fully as well cured as is the ordinary practice with unchopped hay. However, some evidence was obtained that with a very narrow width of container, more completely ventilated walls, and a longer cut, thus decreasing the density, good results might be secured with hay of slightly higher moisture content.

Volumes and weights of stacked hay, H. E. Murdock (*Montana Sta. Bul. 327 (1936), pp. 22, figs. 4*).—The results of this study indicate that the actual volume of a haystack as ordinarily built can be closely estimated from measurements, but that the unit weight of hay varies between wide limits. A satisfactory mutual agreement should be entered into by the buyer and seller of stacked hay as to the method of arriving at the market value of a given volume of hay. The rate of settlement of hay is rather rapid for the first few weeks after it is stacked, after which time the volume remains fairly uniform until the hay is further packed by the winter snows and spring rains. This rate is apparently independent of the kind of hay, the stacker used, and the year. Rather definite relations were established between the volumes of a given stack at different ages. The range in the average weight per cubic unit of different kinds of hay is large. The range in the average weight per cubic unit of any one kind of hay is also large, and no rule can be made that will give an accurate estimate for any given stack. When a large amount of stacked hay is purchased the measurement of the stacks and estimate of weight may be fairly accurate, but where only a few stacks are involved there is much greater chance for error and weighing should be resorted to if at all possible.

[Dust explosion and spontaneous ignition of hay investigations] (*U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1936, pp. 29–32*).—Progress results are briefly reported.

Farm building costs and appraisals, G. B. Hanson (*Agr. Engin., 17 (1936), No. 10, pp. 413–416, 422, figs. 5*).—This is an analysis from the U. S. Resettlement Administration.

Inspection and appraisal of farm buildings for insurance purposes, E. D. Anderson, C. H. Frick, and L. G. Keeney (*Agr. Engin., 17 (1936), No. 10, pp. 417, 418, 425, fig. 1*).—Modern methods in the appraisal of farm buildings for insurance purposes are analyzed.

Appraisal of farm improvements, E. W. Lehmann (*Agr. Engin., 17 (1936), No. 10, pp. 419–422, figs. 2*).—This contribution from the Illinois Experiment Station points out five main considerations in the appraisal of farm improvements, these involving the engineering phases, the requirement for improvements on a farm as a going concern, the cost of reproducing improvements, the depreciation, and the actual value of improvements on the farm as a producing industry.

Masonry barn design and construction, H. Giese, H. J. Barre, and J. B. Davidson (*Iowa Sta. Res. Bul. 207 (1936), pp. 253–297, figs. 34*).—This bulletin reports the results of a study initiated in 1913 of the design of an all-masonry barn which might be constructed at reasonable first cost with the advantages of permanent and fire-resistant construction. The studies were confined largely to the roof. In addition to a number of design studies, models of roof sections were built to develop a method of roof construction. Strength tests were made on these models to check the reliability of the designs. The information obtained served as the basis of the design and method of constructing an experimental barn, which was built at Iowa State College in 1926–27. The results indicate that the masonry arch is a very stable type of roof structure. The tests on sections were found to check the design calculations closely.

The construction of the roof was found to be difficult and involves a large amount of labor because of (1) the use of heavy steel forms to carry a large

part of the roof weight; (2) the manipulation of the forms in erection, moving, dismantling, and transporting; and (3) the handling and placing of roof materials.

The additional cost of the roof over a wood frame type construction is due not so much to the cost of materials as to the cost of the unproductive labor in handling the materials and in manipulation of the steel forms. The overhead cost of the forms becomes a large item in the first cost if they are used for only one or a few barns.

Experiments in the methods of making a roof watertight have not as yet indicated an entirely successful method. A heavy-fibered asphalt has been found the best of the waterproof coatings which have been used. Leaks appear to be due to slight openings in the joints and to the development of fine cracks.

A roof with a span of 34 ft. and a height of 20 ft. provides enough storage space for most conditions.

An important feature of this publication is the contribution it makes toward the principles of design of reinforced concrete arches as they relate to a roof suitable for a barn. Special attention is given to size, shape, and loading, and the structural principles relating to these are mathematically and graphically expressed.

Electrical ventilation for livestock structures, C. H. JEFFERSON and D. G. EBINGER (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 81–87, figs. 4*).—Technical information is given on the design, installation, and operation of electrical ventilation systems for livestock structures.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Arkansas Station, 1935–36] (*Arkansas Sta. Bul. 337 (1936), pp. 65–69*).—Results of investigations not previously noted are reported by C. O. Brannen as to decreases in real estate and personal tax delinquencies from 1933 to 1935 and as to the sources of county funds and the expenditures for roads, indebtedness, and other purposes in 1931 and 1932; by R. B. Craig and O. J. Hall, as to the burden of ad valorem taxes on producing and cut-over forest lands; as to receipts, expenses, taxes, and changes of inventory on 396 selected farms in 1935; by Hall, as to the use of lands rented by the Agricultural Adjustment Administration in 1934 and the number of applications to redeem, donate, and purchase State-owned lands in the years 1927–35 and from January 1 to June 9, 1936; and by H. W. Blalock, in a study of 89 representative cotton plantations, in cooperation with the Works Progress Administration, as to labor income of landlords and tenants, the sources of the income of tenants, and the expenditures for food, clothing, health, and other purposes by tenants.

[Investigations in agricultural economics and farm management by the Missouri Station, 1934–35] (*Missouri Sta. Bul. 370 (1936), pp. 23–26, 73*).—Results of investigations not previously noted are reported briefly as follows: Findings (1) by B. H. Frame as to the contribution of farms to family living on 72 Atchison County farms and the average receipts, expenditures, and labor income on 30 farms in 1934 in the same county; (2) by O. R. Johnson and Frame as to the adjustments in the cropping systems due to production control on 316 Atchison, Nodaway, and Linn County farms; (3) by C. H. Hammer and H. Jenny as to the use of a differential system of land classification; and (4) by H. L. Kempster on the feed-purchasing power of eggs.

The world agricultural situation in 1934–35 (*Roma: Internatl. Inst. Agr., 1936, pp. VIII+533+[1]*).—This volume, the sixth in the series previously noted

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(E. S. R., 76, p. 410), is a commentary on the International Yearbook of Agricultural Statistics for 1934-35 noted on page 712. Part 1, world agriculture, discusses the changing structure of world economy and the economic conditions of agriculture and summarizes the position and tendency during the year of the international market for cereals, sugar, coffee, tea, wine, grapes, olive oil, tobacco, textile materials, livestock, and livestock products. Part 2, agricultural policy and conditions in the different countries, follows the same general plan as in previous volumes.

Income in agriculture, 1929–1935, R. F. Martin (*New York: Natl. Indus. Conf. Bd., Inc., 1936, pp. XVIII+168, [figs.] 17*).—This volume summarizes the results of an analysis of official and other statistics relating to agricultural income and purchasing power in chapters on gross income in agriculture, other income of farm operators, taxes and interest, rent and depreciation, wages, and other current operating expenses, net agricultural income of farm operators, income parity for agriculture, purchasing power parity for agriculture, and comparative income status of farm operators. Appendixes include a description of the sources of data and methods used in the study and evaluations of the census of agriculture and the U. S. Department of Agriculture's estimates of agricultural income as sources of income data.

"These data indicate that in 1929 the net occupational incomes of farm operators were about on a par with those of other gainfully occupied groups in most regions of the country, and considerably higher in some regions. Available data for later years indicate that there was an income disadvantage for farm operators as compared with fully employed persons in manufacturing and retail trade, but that farmers were about on a par with salary and wage earners as a whole. A further general finding is that pronounced variations in the comparative income status of farm operators occur from year to year in the different regions in response to special conditions of agricultural production, as in the case of droughts, and market influences, such as unfavorable prices in foreign markets for certain export products. This would suggest that the farm problem in the United States, insofar as it does not relate to temporary regional disasters, such as drought or insect damage, or to drastic general economic depressions, is not a longstanding problem of income disparity requiring the forced diversion of income from other gainfully occupied persons to farm operators. It does not differ from that of the rest of the national economy. The problem is to increase employment and productivity in all industries, including agriculture, and to facilitate the flow of income and goods and services to the whole population."

Farm buying and industrial recovery (*U. S. Dept. Agr., Agr. Adjust. Admin., 1936, pp. III+22, fig. 1*).—This is a survey of shipments of manufactured and industrial commodities from manufacturing areas to agricultural areas from July 1, 1932, to June 30, 1935. It includes only carlot shipments, but these constituted over 95 percent of the total weight of all shipments. The information was obtained by a study of over one-half million freight waybills and waybill abstracts in the freight auditors' offices of 16 railroads which handle approximately 75 percent of the traffic in manufactured commodities delivered to the agricultural regions. The commodities studied were divided into four main groups—(1) agricultural, commodities used principally in farm production; (2) domestic and personal, commodities used principally in the home, whether urban or rural; (3) industrial and commercial, commodities used primarily in industrial and commercial activities; and (4) general, commodities used generally on farms, in homes, and in industry. Tables show for the years ended June 30, 1933, 1934, and 1935, the total shipments for each group of commodities and for all groups;

the shipments in each commodity group and all groups into the southeastern, southwest, and northwest regions; and the shipments by States of origin to all regions and to the southeast, southwest, and northwest regions.

Type of farming [in Delaware], M. M. DAUGHERTY (*Delaware Sta. Bul. 203* (*1936*), *pp. 7, 8*).—Studies of the statistical trends of crops and livestock grown in the State, of varieties and plantings of apples and peaches, and of shipments of feeds into the State are reported.

Agricultural economic conditions in Iowa, 1935, T. W. SCHULTZ (*Iowa Yearbook Agr., 36* (*1935*), *pp. 249–285, figs. 20*).—The status in 1935 of farm income, prices of farm products, prices paid by farmers for commodities used in living and production, wages of farm labor, farm taxes—total and for highways and schools, farm indebtedness, farm capital structure, tenure of farmers, tenancy, etc., are discussed and comparisons made with other years or periods.

Farm organization and management in Webster County, J. A. HOPKINS (*Iowa Sta. Bul. 350* (*1936*), *pp. 365–408, figs. 7*).—This study was made to determine the types of farm organization best adapted to the utilization of land and other farm resources in Webster County, and the results are applicable to a large degree to the southern part of the Iowa cash-grain area. It is based on the detailed studies of organization and management of 26 farms in 1928, 39 in 1929, and 49 in 1930. The crop system and livestock industry of the area are described, and effects of tenure on type of farm, crops produced, rotations, disposition of crops, and the hog and cattle industry are discussed. Analysis is made of the income and expenses on the farms studied.

Crop-share tenants had a higher percentage of land in corn and usually a smaller number of livestock per farm than owners. Crop rotation differed little between types of farms but considerably within each type. Cash-grain farms sold, on an average, 11 bu. each of corn and oats for each acre in the farm, general farms 6 and over 7 bu., respectively, and hog farms 4 and 6 bu., respectively. The four beef-feeding farms studied bought 9 bu. of corn and sold 2 bu. of oats per acre in the farm. About 70 percent of the corn and 45 percent of oats grown on hog farms were fed on the farm, 60 and 40 percent, respectively, on general farms, and 40 and 20 percent, respectively, on crop farms. About two-thirds of the corn fed in each case was fed to hogs. Of the total income of the farms studied, 41 percent on hog farms and about 25 percent on crop and general farms came from the sale of hogs; 15 percent on hog farms, 20 percent on general farms, and 5 percent on crop farms from cattle sales; and 28 percent on hog farms, 34 percent on general farms, and 59 percent on crop farms from the sale of crops. The net cash income for 1928 and 1929 on farms of comparable size varied little between the types of farms. The greatest return per $100 of feed fed hogs was on farms with from 7 to 12 litters of spring pigs and on farms with no fall pigs. Total income and returns per $100 of feed fed were highest in dairy herds and lowest in beef herds. Returns per $100 of feed fed increased with beef production per cow up to about 900 lb. in beef herds and to 800 lb. in dual-purpose herds, but decreased with each increase in dairy herds. The returns increased with increased butterfat production per cow up to 240 lb. in dairy herds, to 80 lb. in beef herds, and to 100 lb. in dual-purpose herds. Management returns in 1928 and 1929 averaged $384 on the farms under 120 acres; $663, $1,095, $972, and $941, respectively, on hog, beef, crop, and general farms of from 120 to 279 acres; and $1,731 on farms of 280 acres or more. The livestock sales averaged $669 higher, crop sales $514 lower, and net farm income $710 less on 15 owner farms than on 19 crop-share farms. The management returns, 1928 and 1929, on 120–279-acre farms averaged $1,770 on the 5 most profitable farms, $939 on the 5 medium profitable farms, and $30 on the 5 least profitable farms.

[Investigations in farm management by the Michigan Station, 1934–36] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 33–37*).—Included in addition to results previously noted are (1) tables showing the average yield and cost per acre or per head of apples, onions, sugar beets, dairy cows, hens, pullets, feeder lambs and steers, and 2-plow tractors in 1934 and 1935 on farms where enterprise records were kept, and the variation in earnings on 170 farms of different sizes in central Michigan in 1935; (2) average costs, yields, or gains, etc., as shown by cost studies of 80 apple orchards in 1935, 15 lots of feeder cattle, dairy herds in 1934 and 1935, lamb feeders in 1934–35, and poultry in 1934 and 1935; (3) tractor costs in 1934 and 1935; (4) the recommendations for crop and livestock adjustments in the State, based on studies made in 1935.

Types of farming in Montana.—I, Physical environment and economic factors affecting Montana agriculture, N. W. Johnson and M. H. Saunderson (*Montana Sta. Bul. 328 (1936), pp. 79, figs. 30*).—Ownership and uses of lands; the physical, economic, and biological factors affecting location of farms and ranches and use of land; the geographic distribution of the principal crop and livestock enterprises; and past and possible future adjustments are discussed.

Land use in New Hampshire, K. W. Woodward (*Jour. Forestry, 34 (1936), No. 11, pp. 975–982*).—Stating that the varied geography of the State results in a great variety of climatic and soil environments, the author discusses past developments and present status and trends of agriculture in New Hampshire and outlines constructive plans for land use and taxation that would promote a permanent and sustained forestry and agriculture.

A study of the trends of Montana livestock numbers, prices, and profits, M. H. Saunderson (*Montana Sta. Bul. 329 (1936), pp. 20, figs. 17*).—This bulletin presents "an economic interpretation of the past and recent trends of Montana livestock population, prices, and values, with a background of national supply and demand conditions. Most of the graphic data used cover the years 1890 to 1935." It is based chiefly on Federal and State crop and livestock estimates and studies by the station of livestock prices, production costs, and ranch profits and investment values.

Annual cattle shipments from the State approximated 220,000 head from 1890 to 1915, with little fluctuation from the average, and approximately 350,000 head from 1915 to 1935, but with large fluctuations from year to year. Sheep population increased rapidly to 1900, declined slightly to 1910 and then rapidly to the low point in 1920, and then increased to about the 1890–1935 average (4,000,000 head) from 1930 to 1935. Wool production increased to about 1903, decreased to about 1920, and since 1930 has been about the 1890–1935 average of 28,000,000 lb. Horses increased from 1890 to 1920, and then decreased. Number of swine reached the peak in 1917, and in 1935 was the lowest since 1910. Number of dairy cattle increased to about 1920 and has been about stationary since that time. From 1890 to 1910 there was a rising trend in the value of Montana cattle. The ratio of Montana to Chicago beef cattle prices has gradually declined from about 80 percent in about 1908 to about 60 percent in 1935. There was a steady rising trend in Montana sheep values from 1895 to 1915. Since 1915 the prices have agreed quite closely with those for the United States. Montana wool prices ranged from 10 to 20 ct. per pound from 1890 to 1905. Prices, 1914–35, have fluctuated widely, but since 1933 have been approximately the 1890–1934 average, 23.3 ct. per pound.

Economic aspects of livestock problems [in Montana] (*Montana Sta. Rpt. 1935, pp. 30–35, fig. 1*).—Data are included as to the disposition of different kinds of livestock, 1926–31; age at which cattle are marketed; and the relation

of tenure of land, tax delinquency, mortgage foreclosures, and farm credit to the livestock industry.

Dairy costs and returns in Michigan, K. T. WRIGHT and A. C. BALTZER (*Michigan Sta. Quart. Bul., 19 (1936), No. 2, pp. 75–81, figs. 2*).—The results of the fourth year, 1935–36, in the dairy costs study (E. S. R., 74, p. 273) are reported. Complete cost records were kept on 148 herds averaging 13.2 cows.

The average costs in 1935–36 were $122 per cow, $1.86 per 100 lb. of milk, and 42.9 ct. per pound of butterfat. The average credits were $160, $2.08, and 47.8 ct., respectively. As the average butterfat production per cow increased from 236 to 422 lb., the total costs per pound of butterfat decreased from 41 to 33 ct., and the labor returns per hour increased from 33 to 54 ct. The feed cost per pound of butterfat averaged 12.5 ct. for 30 herds having the lowest cost and 23 ct. for 30 herds having the highest cost. Management returns per herd were over 6 times as much in herds of 26 cows as in herds of 6 cows. Milking machine costs averaged $3.30 per cow in the 30 herds (averaging 17.8 cows), for which records were available. Total monthly costs per cow ranged from $12.81 in March to $8.33 in September. Total income per cow was highest in April and lowest in October, and the net return per cow was highest in June and lowest in October.

The production-consumption balance of agricultural products in Michigan.—Part 3, Field crops, G. N. MOTTS (*Michigan Sta. Spec. Bul. 278 (1936), pp. 30, figs. 5*).—This is the third bulletin of the series previously noted (E. S. R., 75, p. 559). Tables, charts, and text show for wheat and wheat flour, rye and rye flour, buckwheat and buckwheat flour, corn, oats, barley, feeds and feedstuffs, hay, alfalfa and clover seed, field beans, and sugar beets and beet sugar the production in the State, the State's commercial requirements or consumption, shipments to and from other States, etc., by years 1924–25 to 1934–35.

An average of 36 percent of the wheat produced in the State was used for seed, feed, and flour for home use. Sixty percent of the wheat milled in the State was grown in the State. Receipts of wheat from other States exceeded shipments to such States by a yearly average of 2,053,000 bu. From 1920 to 1935 an average of 1,910,000 bbl. of flour was milled in the State, which was less than 47 percent of the estimated State requirements. Thirty-three percent of the flour output of the State was sold in other States, and the receipts from the States averaged 2,789,000 bbl. Rye and buckwheat are minor crops in the State, and the production of both declined from 1924 to 1934. Rye acreage in 1935 increased 44 percent and production nearly 124 percent, due to the increased demand from distilleries. From 1924 to 1932, from 40 to 66 percent of the rye was shipped to other States. Shipments of buckwheat to other States amounted to about one-third of the production from 1924 to 1928 and to one-fourth from 1932 to 1934. The State is a deficit producing State for rye and buckwheat flour. From 1924 to 1934 only 3.2 percent of the corn, 12 percent of the oats, and 10 percent of the barley produced were sold from the farms. Approximately 0.5 percent of the corn, 2 percent of the oats, and from 3 to 8 percent (1929–30 to 1932–33) of the barley was shipped to other States. Oats shipments to other States exceeded receipts from such States. The State is a deficit State as to yellow corn and barley if malting barley is included. From 1929 to 1935, from 5,300,000 to 6,660,000 bu. of white corn were brought in from Illinois and Indiana for cereal manufacture. The State is essentially self-sufficing in hay but is a deficit State for alfalfa and clover seed. The consumption in the State for dry and canned beans is approximately 15 percent of its production. Shipments to other States averaged 2,500,000 bags. The beet sugar output, 1928–35, averaged 45 percent of the consumption in the

State. Shipments to other States exceeded receipts from such States in 3 of the 6 yr. 1928–33. From 1928 to 1933 the consumption of cane sugar in the State amounted to 49 percent of the total sugar consumption.

Federal seed-loan financing and its relation to agricultural rehabilitation and land use, N. J. Wall (*U. S. Dept. Agr., Tech. Bul. 539 (1936), pp. 60, figs. 15*).—"The purpose of this bulletin . . . is to present (1) a general history and description of Federal seed-loan financing; (2) an analysis of the financial and economic status of seed-loan borrowers in four southeastern States in 1932, based upon data submitted with seed-loan applications; and (3) a summary of the problems involved in seed-loan financing, with particular reference to the cotton States, together with a suggested approach for effecting a solution of such problems." The beginning and expansion of Federal seed loaning, emergency loans for purchasing feed, loan procedure, the security for loans, and interest rates are described. Analysis is made of factors affecting the cost of making loans, administrative costs, and loss of principal. Using the sample of 480 applications for loans in 1932—40 in each of 12 counties in Virginia, North Carolina, South Carolina, and Georgia—analysis is made of the purpose and size of loans, other indebtedness, size of farm and acreage planted to major crops, livestock and poultry owned, and size of families. Appendixes include the provisions of statutes providing for the various seed loans 1921–35, the amounts of loans and percentage collections by States under the different appropriations, specimen of the application used in making loans in 1932, and a review of the operations of the regional agricultural credit corporations established in 1932.

The analysis of the loan applications showed "(1) the chief use made of loan proceeds has been for the purchase of fertilizer and other farm supplies, a purpose for which merchant credit with abnormally high interest charges was formerly used. (2) The large proportion of loans involving only nominal amounts indicates that the problem of financing the purchase of fertilizer and supplies present obvious difficulties to lending agencies that are solely dependent upon the interest return on their advances to cover the cost of examining the loan application, and in effecting the collection of the loan. (3) The amount of other indebtedness, excluding seed loans, for most of the borrowers, does not appear excessive upon an individual basis. Although this indebtedness in relation to the individual borrower's farm income may be large, data on crop acreage and on livestock and poultry owned suggest that debt-paying capacity may be handicapped by the existing organization of farm operations. (4) The size of farm and the acreage devoted to major crops indicate that the seed-loan problem involves primarily the small farmer, whose operations are chiefly of the subsistence type. (5) The data that show a surprisingly large proportion of borrowers with little or no livestock and poultry owned indicate that increased livestock holdings would improve the standard of living of this group of farmers and reduce their dependence upon credit for the purchase of family food. (6) The average of over five persons in each borrower's family indicates that the financing problems herein discussed are influencing a very large segment of the agricultural population in these four States."

Suggested methods of improving the credit status of chronic seed-loan borrowers include (1) the imposition of certain crop programs, particularly the requirement that feed for work stock and food for the family be raised at home; (2) a study of records of individual borrowers to determine the borrowers' debt-paying capacity and the refusal of credit to borrowers who have not shown a satisfactory attitude toward their debt obligations; and (3) the making of advances under loans in the form of merchandise and supplies,

with a sufficient margin added to the selling price to include the nominal loss ratio that might be anticipated.

Public expenditures in Oregon by spending units and major functions as measured by tax levies imposed upon general property, W. H. DREESEN (*Oregon Sta. Bul. 346 (1936), pp. 142, figs. 28*).—The tax laws of the State are described briefly. Tables show by years 1910–34, inclusive, by counties and counties grouped into four sections—coast, Willamette Valley, southern, and eastern—the weighted average rural and urban tax levies in mills and on equalized valuations for State, county, school, road, debt service, and miscellaneous purposes. Special city levies are also shown in the urban levy tables. Graphs show by counties the increases and percentages of average increases from 1910–13 to 1932–34 in millage levies and by groups of counties and for Multnomah County the weighted average levies by years 1910–34.

There was a general upper trend of rural levies and taxes from 1910 to approximately 1928, followed by a recession during the depression years. The upper trend in urban taxes and levies continued well into the depression years. "Revenues derived from independent sources, especially from income and excise taxes, account for the decline in levies for State purposes during recent years. The recent decline in road levies, both rural and urban, is due to the increasingly larger part played by the State in the construction and maintenance of roads and highways." Total urban general tax levies rose approximately 219 percent from 1910 to 1930 and then declined 17 percent of the 1930 peak to 1934. Rural levies rose approximately 218 percent from 1910 to 1928 and then declined 28 percent from the 1928 peak to 1934. In terms of the 1926 all-commodity index dollar, rural taxes were approximately 267 percent of the 1910 amount in 1932 and 217 percent in 1934. From 1920 to 1930 per capita rural taxes decreased $7.99 in the coast counties, $4.98 in eastern Oregon, $15.92 in southern Oregon, and $5.48 in the Willamette Valley counties. Per capita public school taxes increased during the period. Total per capita taxes, urban school taxes, and special city taxes rose in all divisions during the period. During the 1910–34 period rural levies for State purposes averaged from 8.8 to 13.7 percent of the total levies in the different divisions of the State, county levies averaged approximately 20 percent, road levies 25 percent, and public school levies from 30.2 to 42.7 percent in the different divisions. Urban levies for State purposes averaged from 5.1 to 9.65 percent in the different divisions and Multnomah County, county taxes from 9.02 to 11.49, and roads from 5.12 to 12.21 percent. Special city and school levies each exceeded 33.33 percent.

Agricultural prices, F. L. THOMSEN (*New York and London: McGraw-Hill Book Co., 1936, pp. X+471, figs. 110*).—This textbook assembles in a form suitable for instruction purposes materials on agricultural prices. "The book is not a commentary on the present economic situation of agriculture or of the individual commodities included in the last seven chapters, but a collection of principles designed to prepare the student for making such evaluations in the light of changing supply and demand conditions." The material is arranged in chapters on the application of price information, the demand curve, the supply curve, price determination and discovery, index numbers and measures of changes in demand, relation of agricultural prices to changes in demand and the general price level, the relation of agricultural prices to commodity surpluses, agricultural price-raising measures, methods and materials of price analysis, time elements in prices, graphic multiple correlation in price analysis, analysis of trends, cycles, and seasonal variation, the relation between cash and futures prices, and price forecasting and the preparation of outlook reports. Seven additional chapters on prices of individual commodities—hogs, beef cattle, sheep and wool, dairy products, poultry and eggs, grain, and cotton—are also included.

Early developments in cooperative cotton marketing, O. W. HERRMANN and C. GARDNER (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Circ. C-101* (*1936*), *pp. II+46, figs. 10*).—The development of cooperative cotton marketing under the Grange and Farmers Alliance, the activities of early cotton associations, the cotton marketing efforts of the Farmers Union, the development of independent associations, the organization of the American Cotton Association, large-scale State and regional associations, the American Cotton Growers Exchange and the American Cotton Cooperative Association, and the establishment of cooperative gin associations and cottonseed oil mills are discussed.

Sampling American cotton: Prevailing practices and some factors affecting representativeness of samples, S. W. MARTIN and F. CLEAVES (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 37, figs. 11*).—Data were obtained by visits to 148 compresses and warehouses, 161 cotton buyers, and a large number of ginners. The different methods used in drawing samples are described, and factors affecting the representativeness of the samples by the different methods are discussed. Extracts from State laws relating to false packing of cotton are included.

International yearbook of agricultural statistics, 1934–35 (*Internatl. Inst. Agr.* [*Roma*], *Internatl. Yearbook Agr. Statis., 1934–35, pp. XXXV+896*).—This volume continues the series previously noted (E. S. R., 76, p. 415), with some additional tables on the production and distribution of crops. The number of countries included in the section on trade movements has been increased, and some new series of index numbers of prices have been added.

General crop revisions, crop years 1924–1935: Acreage, yield, and production (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1936, pp.* [*1*]*+103*).—Tables show by States by years 1924–35, inclusive, the acreages, yields, and total production for grain, silage, forage, seed, etc., of corn, wheat, rye, oats, barley, flax, rice, sugar beets, sugarcane, sorghums, potatoes, sweetpotatoes, tobacco, cotton, and hays. The revisions are limited chiefly to the years 1930–35, inclusive, and are for the purpose of making the Department's estimates more consistent with enumerations of the 1935 Census of Agriculture of the Bureau of the Census.

[**Iowa farm statistics**] (*Iowa Yearbook Agr., 36* (*1935*), *pp. 351–482, figs. 29*).—Data collected by township assessors and tabulated by the Iowa Weather and Crop Bureau are included covering the number, size, and acreage of farms; tenure of lands; land use; numbers of tractors, automobiles, auto trucks, and radios; acreages and production of different crops; number of different kinds of livestock on farms, January 1, 1936, number of sows farrowed in the fall of 1935, and number of sows bred to farrow in the spring of 1936; etc., are presented by counties and districts in tables and maps and in a general summary table for the State. The summary tables are discussed. Other tables show for the State the acreages, production, and farm value December 1 in 1880, 1885, 1890, and 1896–1935 for corn, oats, wheat, barley, rye, flaxseed, potatoes, and tame and wild hay. Similar figures are included for alfalfa for 1900, 1905, and 1909–35 and for soybeans 1919–35.

Missouri farm census, by counties, 1935 (*Missouri State Dept. Agr. Bul., 34* (*1936*), *No. 5, pp. 20*).—Data collected by the Missouri State Department of Agriculture in cooperation with the Bureau of Agricultural Economics, U. S. D. A., are presented in tables showing for the State the acreages, production, and value of different farm crops, and the value of different kinds of livestock, dairy products, and other farm products; and by counties the acreage, yield per acre, 1935 and the 5-yr. average 1929–33, the total production of different crops, and the numbers of different kinds of livestock and chickens on farms, January 1, 1936.

Revised estimates of buckwheat acreage, yield per acre, and production, 1866–1929 (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 34*).—Estimates are included for the United States by regions and by States. The revised estimates for production are somewhat higher than previous estimates for the years 1866, 1869, and 1909–29, inclusive.

RURAL SOCIOLOGY

[**Sociological studies in Arkansas**] (*Arkansas Sta. Bul. 337 (1936), pp. 49, 50, 69, 70*).—Data are reported on health services in rural areas, by I. C. Wilson and W. H. Metzler; marketing the products of home industries, by Wilson and T. W. Douglas; and the characteristics of rural rehabilitation clients, by W. T. Wilson and Metzler.

[**Investigations in rural sociology at the Michigan Station**] (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 45–48*).—Data are given on the socializing influences of organizations in relation to rural life; nationality and population groups in Michigan and their contribution to agriculture and rural life; the standard of living of farm families in relation to types of farming, farm products, income, and community opportunities; and case studies of rural communities.

[**Rural sociology studies in Missouri**] (*Missouri Sta. Bul. 370 (1936), p. 74*).—Brief notes are given on the availability, use, and needs for additional library service in rural communities in Missouri, by E. L. Morgan and M. W. Sneed, and the rural church in Missouri, by Sneed and D. Ensminger.

Community and neighborhood groupings in Knott County, M. Oyler (*Kentucky Sta. Bul. 366 (1936), pp. 123–156, figs. 7*).—This is part of a comprehensive study of land utilization and related economic and social problems in Knott County in which the station cooperated with bureaus and divisions of the U. S. Department of Agriculture. The various organizations and communities and neighborhoods and their trends are described and discussed.

Purchase and sale of meats and starchy foods by Tennessee farm families.—A preliminary report, C. E. Allred and J. C. Powell (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Rpt. 23 (1936), pp. II+34, figs. 15*).—This is the fourth of this series of studies (E. S. R., 76, p. 414).

White farm owners of Tennessee produce 96.9 percent of the meat consumed, but 22.09 percent of the starchy foods consumed is purchased. Districts in which commercial types of farming prevail purchase the largest percentage of their vegetative foods.

Status and migration: Notes on certain principles of migration applied to American migrants to Shanghai, H. D. Lamson (*Rural Sociol., 1 (1936), No. 4, pp. 472–482*).—"The purpose of this article is to examine certain 'laws' of migration in the light of one foreign community in a great Oriental seaport."

A registration system as a source of data concerning internal migration, C. Taeuber (*Rural Sociol., 1 (1936), No. 4, pp. 441–451*).—The data analyzed here deal only with the city of Kiel, Germany, and are intended to illustrate the type of information available. "Short-distance migration predominated among persons moving into the city as well as persons moving out of the city. However, the least trained occupational groups (laborers and domestic servants) came from short distances more frequently than the more highly trained occupational groups, and skilled workers traveled greater distances than unskilled workers. Similarly, persons with large incomes were infrequent among the migrants into the city but came from greater distances than persons with smaller incomes. Numerically, the migration out of the city was largely a counterpart of the migration into it, and the occupational and geographical

distributions of migrants out of the city paralleled closely those of the migrants into the city."

The influence of the AAA cotton program upon the tenant, cropper, and laborer, F. C. FREY and T. L. SMITH (*Rural Sociol., 1 (1936), No. 4, pp. 483–505, figs. 5*).—The AAA cotton-reduction program has greatly curtailed the annual migration of families (tenants and croppers) from one plantation or farm to another. The increased income from cotton has enabled the planter to be more generous in his advances, and the tenants and croppers know that if they leave their present location they may not be able to find another where a quota of cotton is to be had.

Rural families on relief, T. C. MCCORMICK (*Rural Sociol., 1 (1936), No. 4, pp. 430–440*).—"This paper is a brief summary of a survey of rural families receiving relief from State Emergency Relief Administrations, made in the winter of 1933–34 in 19 States and 47 counties by the Federal Emergency Relief Administration."

Educational status of rural relief families in Tennessee.—A preliminary report, C. E. ALLRED and B. D. RASKOPF (*[Nashville]: Tenn. Works Prog. Admin., 1936, Rpt. 22, pp. III+41, figs. 29*).—This is a preliminary report on the educational status of rural people on relief in Tennessee, by age, race, tenure, sex, and residence. It presents in graphical and statistical form the educational status of members of rural households who were accepted by relief agencies. Data on which it is based were obtained from surveys in 12 representative counties conducted cooperatively by the Federal Emergency Relief Administration, the Tennessee Emergency Relief Administration, and the Tennessee Experiment Station.

Of the 2,873 heads of all relief households studied, about 17 percent have never attended any school, 54 percent have only schooling through the fourth grade, 20 percent have completed the elementary school, and less than 8 percent have any high school or college training. Of the 1,831 wives of these heads, about 15 percent have no schooling whatever, but 24 percent have advanced beyond the seventh grade, and less than 8 percent have any high school or college training.

Of all the children of relief households, 46 percent of those 8 yr. of age have never attended school. From 15 to 19 yr. of age only 10 percent have completed the eighth grade, from 20 to 25 yr. 14 percent have no schooling whatever, and less than 16 percent have received training above the elementary grades. A very high percentage of the children from 6 to 15 yr. of age do not attend school although they fall within the age of compulsory attendance. On a percentage basis, more girls than boys are in school in every tenure group.

The educational attainment of negro children is low compared with whites, but a lower percentage of the younger age groups have no schooling, indicating better educational opportunities for negroes in recent years.

Relation of education to economic and social status of relief clients in Tennessee.—A preliminary report, C. E. ALLRED and B. D. RASKOPF (*[Nashville]: Tenn. Works Prog. Admin., 1937, Rpt. 24, pp. IV+37, figs. 25*).—"This is a preliminary report on the relation of education of Tennessee rural relief clients to their social and economic conditions." The report, prepared in cooperation with the Tennessee Experiment Station and other agencies, is based on surveys of 2,873 relief families in 12 representative counties. Family heads with the most formal education had the largest farms and net resources, had the smallest families, and made the largest use of home production in the family living.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Profitable farm management and marketing for the corn-growing States, M. H. OVERTON and L. S. ROBERTSON (*Chicago: J. B. Lippincott Co., [1936], rev. ed., pp. XII+431, figs. 210*).—This textbook for vocational classes in high schools is based largely on the findings of the State agricultural experiment stations and is suited primarily for use in the corn-growing States. The job analysis plan of presentation is used, the material being arranged as follows: Learning the meaning and importance of farm management; comparing farm enterprises in the region; analyzing the farmer's income; balancing the farm business; selecting a farm of the right size; planning the cropping system; choosing the correct kinds and amounts of livestock; determining an efficient arrangement of fields, pastures, and lots; planning the right kinds, sizes, and locations of buildings; deciding what kinds of fences are necessary; reducing erosion and draining farm land; using farm labor efficiently; selecting the most economical kinds of farm power; equipping the farm with the right machinery; determining whether to rent or to own a farm; deciding how to rent a farm; financing the farm business; keeping practical farm accounts; adjusting the business to changing conditions; determining the nature of the marketing process; adjusting marketing procedure to kind of products; marketing through cooperation; improving marketing by individual action; marketing important crops; and marketing livestock and livestock products.

Nutrition courses in land-grant colleges, E. N. TODHUNTER and B. L. SPARLING (*Jour. Home Econ., 28 (1936), No. 10, pp. 668–670*).—Examination of the catalogs of the 51 land-grant institutions in the States, Alaska, Puerto Rico, and Hawaii showed that 46 have courses in home economics. Tables show the number of institutions offering different types of courses in nutrition and dietetics with the year specified for taking the courses, hours required, and credit given, and the number of institutions requiring prerequisite courses for nutrition courses and the courses required.

Certain bases for predicting scholastic success of freshmen in the college of agriculture, F. M. SACAY (*Philippine Agr., 25 (1936), No. 7, pp. 589–598*).—Scores in the Philippine mental ability test and high school grades for the 73 freshmen in the college in 1932 and the 42 in 1934 and in achievement tests in 1934 prepared by the Bureau of Education were correlated with scholastic success. The coefficients of correlation were as follows: Mental ability 0.59 in 1932 and 0.61 in 1934; high school grades, algebra 0.49 and 0.54, physics 0.46 and 0.65, geometry 0.40 and 0.67, English IV 0.36 and 0.41, general science 0.36 and 0.65, biology 0.35 and 0.52, economics 0.31 in 1932, general history 0.30 in 1932, and age −0.06 and −0.14, respectively, in the 2 yr.; and achievement (1934), algebra 0.63, physics 0.61, geometry 0.58, general science 0.53, biology 0.51, and English IV, 0.47.

FOODS—HUMAN NUTRITION

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1936, pp. 2–6*).—This report (E. S. R., 74, p. 721) summarizes the work of the year in the three sections comprising the Division of Foods and Nutrition and a special study of consumer acceptance of dried skim milk.

A summary is given on the value of soybeans and the relative value of headed and nonheading forms of cabbage and lettuce as mineral sources. Relative values, in addition to data previously noted from special reports, are also given for the ascorbic acid content of various citrus fruits, the vitamin A, B,

and G content of various nuts, and the vitamin B and G content of dried distillers' grains.

The report on food utilization includes data from studies on the influence of the fat and water content of beef on shrinkage during roasting, the cooking quality of 80 unnamed varieties of green vegetable soybeans, the waste in preparation for cooking of various common vegetables, and the effect of time and temperature of processing on the quality of canned meat, with recommendations for the home canning of various kinds of meat. Summaries are also given of studies on the relation of fertilizer composition to the blackening of potatoes on cooking, the relative heat requirements for cooking vegetables by gas and electricity, mineral losses in vegetables with different methods of cooking, consumer preferences for breads, the advantages of the Bureau method v. the jelmeter method for jelly making, and the use of sorghum sirup in food preparation.

[Studies in foods and nutrition from the Arkansas Station] (*Arkansas Sta. Bul. 337 (1936), pp. 9–11, 46–49*).—Progress reports (E. S. R., 74, p. 874) are given on studies by M. C. Kik, B. Sure, and K. S. Buchanan on the influence of vitamin B and G deficiences on the concentration of blood and tissue enzymes; by Sure, Kik, and Buchanan on the influence of vitamin A deficiency on the concentration of blood and tissue enzymes; by Kik on the enzymatic digestion of lactalbumin v. casein in vitro; by Buchanan and Sure on the albumin-globulin ratio of the blood of the albino rat on a standardized dietary regime and on the influence of vitamin B deficiency on the albumin-globulin ratio of the blood of the albino rat; by Sure, Buchanan, and H. S. Thatcher on vitamin A and carcinogenesis; by M. E. Smith and W. L. Bleecker on the causes and prevention of spoilage of home canned vegetables; and by Smith on factors which affect the quality of canned tomatoes.

Meats and meat food products (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1936, p. 23*).—This summarizes studies on the nutritive value of the proteins and the occurrence of the vitamin G complex in certain animal tissues.

The effect of cooking upon the composition and serving value of beef, J. A. Cline and C. Nesbitt (*Missouri Sta. Bul. 370 (1936), pp. 61–63*).—In this progress report tabulated data are given on the cooking time, cooking losses, and number of servings per pound of four cuts of beef—prime rib, chuck, top round, and heel-of-round—roasted to underdone, medium-done, and well-done stages, as determined by the meat thermometer. Data are also reported on the cost per serving of the different roasts calculated on the original cost of the meat, the cost of the gas consumed, and the number of servings obtainable per pound of uncooked meat, and on the range in percentages of protein, fat, moisture, and total ash in the uncooked and cooked cuts. Changes in the composition of the drippings, with increase in doneness, are noted.

A study of seasonal variation in egg white performance, E. A. Burke and K. B. Niles (*U. S. Egg and Poultry Mag., 42 (1936), No. 9, pp. 542–547, 573, figs. 4*).—Weekly scoring of a total of 202 angel food cakes made by the standard recipe from eggs obtained from the same flock on controlled feed is reported. Immediately upon removal from the refrigerator the eggs were separated and the whites were weighed and allowed to come to a temperature of 25° C. After baking, the cakes were inverted and allowed to hang in the pans overnight before being judged.

A seasonal variation in egg white performance was indicated. At the beginning of the experiment in August the cakes were fairly good in quality, gradually declining to a low level in November, with a slight rise in December and a sharp decline in January. A decided increase in quality was noticed in February and March and the quality continued to rise to the highest point in

July when the experiment was terminated. During the low periods the crusts of the cakes were gummy and difficult to cut, and the authors suggest the possibility of a correlation between this observation and humidity. During the "low" and "high" periods, the time required to beat the egg whites to the stiff stage varied. A temperature of 350° F. and a baking time of 45 min. gave the better product.

The influence of raw and sterilized milk on growth and reproduction in rats, H. A. and H. J. CHANNON (*Jour. Hyg. [London], 36 (1936), No. 2, pp. 173–181*).—Two samples of commercial sterilized milk prepared by different processes were compared with the raw milk in a diet of white flour biscuit with the addition of supplements of iron, copper, and manganese salts. At the end of the experimental year the weights of the rats receiving sterilized milk were about 10 percent lower than those receiving raw milk. No difference was noted in the general health of the groups of rats. Litters could not be reared on either the raw or sterilized milk diet, but reproduction was slightly better in the animals receiving raw milk.

The chemical composition and the nutritive value of ripe mango fruits, A. P. C. BIJHOUWER and W. F. DONATH (*Landbouw [Buitenzorg], 11 (1936), No. 9, pp. 370–397; Eng. abs., pp. 396, 397*).—Results of analyses of ripe fruits from the Alphonso tree and six mango varieties growing in Java are compared with analyses of similar fruits grown in other countries. The chemical composition of the fruit and the skin is tabulated. The literature on vitamin research in mangoes is reviewed.

Home canning costs, V. E. SATER (*Washington Sta. Bul. 337 (1936), pp. 27, figs. 2*).—Apples, peaches, tomatoes, corn, and green beans were canned by the open kettle and cold pack and hot pack water bath methods, as described in Farmers' Bulletin 1762 (E. S. R., 76, p. 419) and also following methods used at the Washington State College. In addition some peaches and tomatoes were cold packed and processed in the oven. Time and cost comparisons were made on various methods of canning and on different kinds of equipment. The fuel costs were calculated at average thermal efficiencies for ranges, using different kinds of fuel.

In general the open kettle method resulted in somewhat less time per unit quantity and lower financial cost than the other methods tested. The cold pack and hot pack methods ranked practically the same. Using the data obtained for apple canning and including the initial cost of special equipment and the average operating cost per container, it was calculated that the total cost per container was 6.36 ct. for the quart size and 5.65 ct. for the pint size glass containers and 5.63 ct. for the No. 2½ and 5.11 ct. for the No. 2 enamel-lined tin cans. Canning in tin required slightly less time and electrical energy than canning in glass. When identical processes were used gas, kerosene, and gasoline were the cheapest fuels.

Nutritive value of diets of families of wage earners and clerical workers in North Atlantic cities, 1934–35, H. K. STIEBELING (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 43 (1936), No. 1, pp. 14–23*).—This contribution from the U. S. D. A. Bureau of Home Economics consists of an interim report on the content and nutritive value of winter diets of families living in eight North Atlantic cities, as determined from dietary records secured by the U. S. Bureau of Labor Statistics as part of the 1934–35 Works Progress Administration study of disbursements of families of wage earners and low salaried workers. From the 209 dietary records secured, 73 were selected for special analysis on the basis of the level of expense for food, including one group of 23 families spending from $1.20 to $1.80, 36 spending from $2.38 to $3, and 14 spending from $3.57 to $4.17 per food cost unit weekly. For 70 of these families

records were also available of the level of expenditures for all goods and services per consumption unit during the year covered by the study.

Although in general with increasing income families spent more for food, this was not true of all families, for the data showed a wide range of expenditure for food at any given economic level and a wide range in economic level of families spending similar amounts for food. Consequently some of the data are also classified by annual total expenditures per consumption unit of under $300 (21 families), from $300 to $499 (32 families), and $500 and over (17 families).

With increased expenditure for food there was some increase in the quantities purchased of each group of foods and particularly of eggs, milk, meats, fruits, and vegetables. Families spending the largest amounts for food paid about the same average prices for milk, eggs, potatoes, and dried legumes as those spending smaller amounts, but bought more expensive forms, as well as larger quantities, of foods in the other groups. The same trends, although less pronounced, were shown in the classification of the data by the level of expenditure for all goods and services.

When compared with the dietary allowances compiled by Stiebeling and Ward (E. S. R., 70, p. 416), the average food supply of the lowest expenditure groups was found to be below standard in several respects, that of the middle group to meet the allowance except possibly for calcium, and that of the highest expenditure group to include ample quantities of all nutrients. All of the diets in the highest expenditure group, over 80 percent of those in the middle group, and less than 25 percent of those in the lowest expenditure group met or exceeded the average minimum requirements. It is pointed out, however, that by applying present-day knowledge of foods and nutrition to food selection the low income groups could also raise the level of nutrition and health without necessarily increasing their food expense.

Economy and adequacy of American diets (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1936, pp. 7, 8*).—These pages include a brief description of the scope of the study of kinds and quantities of food purchased and the nutritive value of the diets of wage-earning families, a preliminary report on which is noted above, and a general summary of the analysis of the character of the diets of nonfarm families based on the available data from studies made in the United States during the past 20 yr. A more extensive presentation of the data is to be found in the paper noted below.

Food consumption of urban and village families at different levels of food expenditure, H. K. STIEBELING (*Jour. Home Econ., 29 (1937), No. 1, pp. 6–10*).—All available quantitative data on the food consumption of urban and village families in the United States during 1914–33 have been used to arrive at an approximation of the levels of food consumption accompanying different levels of expenditure for food. The data include 1,020 records from individual families in six studies and two averages reported by the U. S. Bureau of Labor Statistics representing 12,000 families. The figures for food expenditures in the various studies were adjusted to the values for March to May 1935 by use of the U. S. Bureau of Labor Statistics retail food index and were classified by the principal foods or food groups in eight price groups according to yearly per capita expenditures for food, the lowest group from $32 to $65 and the highest from $258 to $290. In all cases figures refer to quantities purchased rather than actually eaten.

The trends in consumption with increased expenditures followed the same lines as noted above as to the diets of wage earners in industrial communities. There were marked increases in the total amounts of all food purchased, but more pronounced in eggs, meats, milk, butter, the succulent vegetables, and

fruits than in grain products, potatoes, dried legumes, and fats other than butter. There was a tendency to purchase more expensive forms as well as larger quantities of foods.

From dietary records secured in the spring of 1935 from families of employed wage earners whose expenditure for food was well above the median, data on the consumption of certain foods at $2.50 to $3.10 per person per week were tabulated for five regional groups. Less striking differences than were anticipated were found in the milk consumption in the different regions, marked regional differences in the consumption of butter and other fats, slight differences in flour and cereals, marked differences (affected by season) in the consumption of potatoes and sweetpotatoes, and also marked differences in the vegetables and fruits noted for their special nutritive values.

When the percentage distribution, according to the level of expenditure for food, of the 1,020 families studied in 1914–33 was compared with that of 2,746 families of wage earners and clerical workers studied in 1934–36, about 30 percent of the families in both studies were in the group spending from $97 to $129 per person per year for food. The diets of these families were thought to meet average minimum requirements, but with little margin for safety. The families in the higher groups were spending enough for food to obtain fully adequate diets with proper care in the selection and preparation of food, but only about half of the families spending as much as $193 to $226 per person per year had diets providing a generous margin of safety in all essentials. The frequency distribution of the families of the various groups in the two studies was very similar.

A study of English diets by the individual method, I, II (*Jour. Hyg.* [*London*], *36* (*1936*), *No. 3, pp. 269–309, figs. 2*).—Two papers are presented.

I. *Men*, E. M. Widdowson (pp. 269–292).—The subjects were 63 healthy men of the English middle class. All food eaten was weighed and recorded for 1 week, and the amounts of calories, carbohydrate, fat, protein, calcium, phosphorus, and iron were calculated. The iron content of the diets is discussed separately (see page 722). The following values were obtained for the average daily intake: 3,067 calories, 13.1 percent derived from protein, 39.1 from fat, and 46.7 percent from carbohydrate; 97.5 g of protein, or 1.4 g per kilogram of body weight; 129 g of fat; 348 g of carbohydrate; 0.87 g of calcium; 1.61 g of total phosphorus; and 16.8 mg of total iron. The consumption of fresh milk varied from 0 to 1½ (imperial) pints daily.

From the 7-day record of the food intake of a lacto-vegetarian, the daily caloric intake was calculated to be 2,835. The total protein, fat, and carbohydrate values were similar in amounts to the average values for the 63 subjects. Due to the increased consumption of milk and cheese the calcium and phosphorus values were approximately doubled.

The food intakes of 6 unemployed men, all of whom were spending less than the British Medical Association (1933) minimum figure of 4s. 10d. per man value per week on food, showed an average daily caloric value of 2,850 and a protein value of 83 g. The consumption of fresh milk averaged 0.22 pint per day. These diets were not as a whole grossly deficient, a fact attributed to the wise spending of the housewives and, therefore, they are not deemed representative of the diets of less intelligent unemployed people.

II. *Women*, E. M. Widdowson and R. A. McCance (pp. 293–309).—Following the same procedure, the food intakes of 63 healthy women were studied and the following values were obtained for the average daily intake: 2,187 calories, 12.8 percent derived from protein, 42.7 percent from fat, and 43.6 percent from carbohydrate; 67 g of protein, or 1.1 g per kilogram of body weight; 100 g of fat; 233 g of carbohydrate; 0.63 g of calcium; 1.13 g of total phosphorus; and

11.4 mg of total iron. The average daily caloric intake was 71 percent of the average value found for the man subjects, so that the average "man value" of the women was 0.7 and not 0.8 as has been accepted. The average consumption of milk was less than ½ pint daily. The quantity of meat consumed averaged 60 percent of the amount eaten by the men.

One case study is reported of a woman cook who maintained apparent good health and strength, with physical energy well above the average, and remained 20 percent overweight on a diet consisting almost entirely of cakes, biscuits, puddings, and fruits.

The food intakes of the wives of the unemployed men were found to be lower in each of the dietary constituents except carbohydrate than the corresponding intakes of the middle class women. The calcium and phosphorus contents of their diets were undoubtedly nearer the minimum requirement for normal nutrition.

Relationship of basal metabolism to dietary intake, J. A. Johnston and J. W. Maroney (*Amer. Jour. Diseases Children, 51 (1936), No. 5, pp. 1039–1051, figs. 6*).—During a 3-yr. study undertaken to determine whether the level of basal metabolism is affected by the intake of protein or whether the total caloric intake alone is the deciding factor, 33 children, ages from 4 to 15 yr., were maintained on measured diets for periods averaging 9⅕ mo. each. The basal metabolism determinations were made by the gasometer method, and the results were compared with Boothby and Sandiford standards (E. S. R., 45, p. 670). The composition of the diet was 15 percent protein, 35 fat, and 50 percent carbohydrate. The results show the expected fall in basal metabolism with a lowered food intake and the prompt return to normal with an increased intake. The subjects receiving a diet high in calories and in protein showed the maximum elevation of the basal metabolic rate. The data favor the view that the amount of protein oxidized may be an important factor in influencing the basal metabolism.

Relation between basal metabolism and adolescent growth, C. A. Lewis (*Amer. Jour. Diseases Children, 51 (1936), No. 5, pp. 1014–1038, figs. 2*).—The purpose of this study was to investigate the relationship between rates of growth in normal persons, as shown by a physical trait, such as stature, and a basic measure of physiologic rate, basal metabolism. The method used was a comparison of the basal metabolism of 50 postpubertal girls, age 14–16 yr., living in an orphan asylum. More than 350 tests were made with the Benedict-Roth closed circuit system and inside soda lime container, modified to include the Benedict helmet.

The results of the study are expressed in total calories per 24 hr., calories per kilogram of body weight per 24 hr., calories per cubic centimeter per 24 hr., and calories per square meter of body surface per hour. It was noted that the oxygen consumption in total calories decreased regularly with age. When the values obtained were classified according to the number of years since the first menstruation, the age at the first menstruation, and the age of maximum increment of growth in stature, no consistent trend was shown. Compared with results of other workers on subjects of comparable age range, the girls in the orphanage had consistently lower basal metabolism rates. The literature was surveyed and evidence presented to show that the distribution of the results over a long series of determinations on subjects approaches a normal curve, therefore an average value obtained from a long series would be a more accurate expression of the basal metabolism than if the minimum value of that series were taken.

A research in adolescence.—I, Pubescence and physical growth, H. S. Dimock (*Child Devlpmt., 6 (1935), No. 3, pp. 177–195, figs. [18]*).—This paper is

the first of a series of articles reporting findings of a research study on 200 adolescent boys. Data concerning physical measurements, personality, and social factors and their interrelationships are given. The standard test procedure, with some new technics, was employed.

The results indicate that the physical strength increases rapidly throughout the adolescent years, the most rapid development taking place during the year which follows the attainment of post-pubescence. The motor ability increases less rapidly during the adolescent years. An improvement in motor coordination was shown during the period of most rapid increase in height and weight. The cases studied did not exhibit loss of motor control, with subsequent awkwardness, when growth and height were increasing particularly rapidly.

Basal energy metabolism and creatinine in the urine.—I, Observations on children, N. B. Talbot (*Amer. Jour. Diseases Children, 52 (1936), No. 1, pp. 16–24, figs. 2*).—The author presents a method of determining basal energy metabolism on the basis of creatinine excretion, determined by the Folin method, and indicates the accuracy of the values so obtained. The subjects were normal children. The metabolism tests were repeated until the results for two periods corresponded within 4 calories per hour. The calories per milligram of creatinine were referred to the variables age, height, weight, and surface area and to the total excretion of creatinine for 24 hr. A much closer relationship was exhibited when the basal energy per unit of protoplasmic mass was referred to the total of this mass rather than to the other variables of growth. The results indicate that the best correlation for heat production is its relation to the protoplasmic mass as measured by creatinine excretion.

Studies on the nutrition of children (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 38, 39*).—This progress report discusses variations found in the investigation noted previously (E. S. R., 73, p. 559), in the composition of identical diets collected at different times, and in the urinary constituents on a constant diet with the time required to reach an equilibrium.

Growth of oriental children in San Francisco: A contrast, M. I. Preston (*Amer. Jour. Diseases Children, 51 (1936), No. 6, pp. 1324–1348, figs. 15*).—Measurements were made of 740 Japanese and 391 Chinese children living in San Francisco. Questionnaires were sent to the homes for data regarding birth date and place and the home diet.

The data obtained indicate that social-economic effects in San Francisco play a part in the health, growth, and development of the Chinese children. The Chinese children were shorter in stature than the white children of San Francisco, the Japanese children of San Francisco and Los Angeles, the native children in Canton, and Cantonese children in Hawaii. The Chinese children weighed less than the Hawaiian Cantonese, and in both height and weight did not show the prepubertal vigor that was found in white and Japanese children. The statures and weights of the Japanese children in San Francisco were less than those of Japanese children in Los Angeles, but the former showed a superior bicristal diameter. The Japanese girls were superior to the boys in weight, pelvic width, stature, and amount of abdominal fat. In general the fat folds of the arm and abdomen were greater in Japanese than in Chinese children. Among the Japanese children there was a higher proportion of bone deformity, a high incidence of dental caries, and prevalence of infections of the upper respiratory tract and tonsils.

The study suggests the great possibility of error in using tables based on height and weight figures of white children as a means of predicting the weight of the oriental children.

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Voluntary food habits of normal children, C. Sweet (*Jour. Amer. Med. Assoc., 107 (1936), No. 10, pp. 765–768*).—The purpose of this paper is to show that healthy children will voluntarily choose an adequate diet from a well-supplied family table. The discussion is based on private practice with children living at home, and case studies are given. During a 3-week period the child is free to select his own foods, and during this period of observation his behavior is recorded by the mother and by the physician. The observer is thus able to acquire a knowledge of the food habits of the family and discover any behavior problems. Certain fundamental dietary rules are given, and an effort is made to re-educate the parents as well as train the child in proper eating habits.

Stock diet for rats, W. Thomson (*Jour. Hyg.* [*London*], *36 (1936), No. 1, pp. 24, 25*).—The advantages are noted of the stock diet for rats being used at the Rowett Research Institute. The mixture is fed in the form of ½ in. cubes and consists of the following: Wheat offal (fine middlings No. 2) 19.2 percent, ground wheat 19.2, Sussex ground oats 19.2, ground barley 9.5, ground maize 9.5, meat and bone meal (45 percent protein) 9.5, dried skimmed milk 7, white fish meal (60 percent protein) 4.7, dried yeast (40 percent protein) 1.2, sodium chloride 0.5, and cod-liver oil 0.5 percent. The cubes are placed in a corner of the cage with approximately 5 g of green feed and 10 cc of separated milk per rat. By routine procedure the litters are reduced to 8 at birth and are weaned at from 21 to 23 days. At 23 days the average weight of the males is 43 g and of the females 41.5 g. The advantages of the cube method of feeding are simplicity, economy, and ease of cleaning cages, and the rats appear to enjoy holding the cubes in their "hands."

Iron in human nutrition, E. M. Widdowson and R. A. McCance (*Jour. Hyg.* [*London*], *36 (1936), No. 1, pp. 13–23*).—The authors give a quantitative evaluation of the total and available iron intakes of the 126 normal healthy men and women referred to on page 719, aged 18–90 yr., living on freely chosen diets, and engaged in sedentary or moderately active occupations.

The 63 women subjects showed an average daily iron intake of 11.4 mg as compared with 16.8 mg for the 63 men. Calculations show that 10.8 mg represented available iron in the men, whereas the comparative figure for the women was 7.9 mg. Some of the women substituted food such as milk and eggs, in which approximately 90 percent of the iron is in an available form, for meat which is high in total iron but relatively low in available iron.

Hemoglobin determinations were made on 42 of the men and 29 of the women subjects, using the Haldane carboxy-hemoglobinometer. The results did not show any correlation between the percentage of hemoglobin in the blood of the women and the amount of total or of available iron in the diet, but there was a slightly positive correlation between the available iron and the percentage of hemoglobin in the men subjects. It is apparent that other factors such as absorption, excretion, and menstrual loss must be considered in interpreting the findings with the women subjects. The lower percentage of hemoglobin in women's blood is either a result of low iron intake or is due to some physiological cause.

To determine whether the administration of additional iron might increase the hemoglobin percentage of normal women, 15 men and 16 women, aged 20–30 yr., were given 100 mg of iron daily in the form of ferrous sulfate or ferric ammonium citrate. Hemoglobin determinations were made weekly. The results indicate that it is difficult to raise the hemoglobin percentage of normal men even by an abnormally high iron intake. The women on the contrary showed an increased hemoglobin percentage in every case, the mean rise being over 10 percent.

The distribution of iron in certain tissues of normal and anemic rats, G. Wakeham and H. F. Halenz (*Jour. Biol. Chem., 115 (1936), No. 2, pp. 429–434*).—Nutritional anemia was induced in the experimental rats, the degree of anemia obtained being shown by determinations of the hemoglobin content of the blood and the erythrocyte count. The animals were divided into three groups—15 normal mature stock rats, ages from 200 to 300 days; 23 anemic rats; and 16 litter control rats, ages from 65 to 90 days. The blood samples were obtained from the blood draining into the body cavity when a lobe of the liver had been excised in the anesthetized animal. Iron determinations were made on various organs, and also on 4 kinds of washed tissue in 33 normal and 26 anemic rats.

The normal control animals showed the following iron values: Blood-free liver tissue 10.33 mg, heart muscle 6.49, kidney 5.61, and striated muscle 2.83 mg per 100 g of tissue. The comparable figures for the anemic rats were liver tissue 4.15 mg, heart muscle 4.79, kidney 3.02, and striated muscle 2.87 mg per 100 g of tissue. Wide variations in iron content of normal spleens were found, the average for both sexes being 40.4 mg per 100 g as compared with 9.42 mg in the anemic animals. The loss of hemoglobin in the blood of these two groups of animals was 77.2 percent. These results indicate that during the development of nutritional anemia the skeletal muscle loses very little iron, the heart muscle about one-fourth of its iron content, the kidney nearly half, and the liver somewhat more than half.

Hemoglobin values in normal adults over a period of time, W. Ingersoll (*Jour. Lab. and Clin. Med., 21 (1936), No. 8, pp. 787–789, figs. 2*).—Hemoglobin determinations were made weekly or oftener during a 4-mo. period on 30 young adults, following the method of Newcomer and using a Bausch and Lomb hemoglobinometer. Personal habits, age, weight, height, and the occurrence of illnesses and of menstruation were recorded for each subject.

The data indicate that normal individuals demonstrate a marked difference as to range, weekly variations, and general trend of hemoglobin values, the variations being greater in the women subjects. There does not appear to be a correlation between hemoglobin values and personal habits such as hours of sleep, slight illnesses such as colds, or menstruation. Based on the results of tests made with 6 subjects, a seasonal variation was noted. The results indicate the possibility of misinterpretation of hemoglobin values as judged from one determination.

Further studies on the availability of copper from various sources as a supplement to iron in hemoglobin formation, M. O. Schultze, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 115 (1936), No. 2, pp. 453–457, fig. 1*).—Previous studies at the Wisconsin Experiment Station (E. S. R., 73, p. 128) have been extended to include tests on the availability of copper from other animal and plant tissues and organic copper compounds carefully purified to prevent contamination with ionic copper. Milk and 0.5 mg of purified iron daily constituted the basal diet of the anemic rats to which such amounts of the various sources of copper were added to supply 0.01 mg of copper daily. Hemoglobin determinations were made weekly by the Newcomer method.

The results indicate that the copper of wheat germ, alfalfa, brewers' yeast, pork heart, pork liver, cysteine cuprous mercaptide, copper aspartate, copper citrate, copper nucleinate, and copper pyrophosphate is readily utilized by severely anemic rats to supplement iron for hemoglobin formation. In general the rate and extent of hemoglobin regeneration were about the same in all cases and corresponded closely with those obtained when 0.01 mg of copper was fed daily as copper sulfate. "Unavailability of dietary copper is apparently of little practical importance."

A study on sulfur metabolism.—II, Comparative investigations of sulfur and protein metabolism in infants and children [trans. title], A. BLAZSO (*Jour. Physiol. et Path. Gén.*, *34* (*1936*), *No. 1, pp. 120–135*).—This study was conducted on 9 infants aged from 3 to 5 days and 9 children aged from 3 to 14 yr. The results show that the proportion of total sulfur to the sulfur fractions of the serum is similar in children and infants. The quantity of inorganic sulfur in the serum is evaluated at from 8 to 10 mg percent, a relatively high proportion when compared with the results of studies on the sulfur content of serum in adult subjects. The sulfur found in the fecal protein represents about 10 to 12 percent of the total sulfur content.

The effect of vitamin A deficiency on the rate of growth of the incisors of albino rats, L. S. FRIDERICIA and S. V. GUDJÓNSSON (*K. Danske Vidensk. Selsk., Biol. Meddel.*, *13* (*1936*), *No. 2, pp. 18, figs. 3*).—Experiments were conducted on groups of adult and young rats receiving an adequate diet and of young rats receiving diets deficient in vitamin A, vitamins A and D, or the vitamin B complex. The adequate diet consisted of casein 18 percent, rice starch 54, dried autolyzed brewer's yeast 5, butterfat 15, agar 3, and McCollum salt mixture No. 185 5 percent. Oxidized lard was substituted for butterfat in the diets deficient in vitamin A and vitamins A and D. Vitamin D supplement in the form of 5 drops of irradiated ergosterol was fed to a portion of the group of young rats on the latter diet. The curative method of estimating vitamin A was followed with one group of young rats, 0.2 g of cod-liver oil being administered after 4 weeks on the vitamin A-deficient diet. Another group received varying suboptimal doses of cod-liver oil (containing about 1,500 international standard units per gram) at the levels of 0.25 mg, 0.5, and 1 mg. The adequate diet without yeast was given to the rats on the vitamin B complex-deficient test. The rate of growth of the "extrinsic" incisors was measured weekly by means of a specially constructed caliper gage.

The results indicated that the presence or absence of vitamin D in a vitamin A-free diet does not influence the rate of growth of the incisors. Almost 3 mo. of vitamin A feeding was required to bring the growth rate back to normal. The diet deficient in the vitamin B complex also depressed the rate of growth, but the effect appeared later than in vitamin A deficiency. The results suggest the possibility of using the measurement of the rate of growth of the incisors as a biological method for the quantitative estimation of vitamin A.

Vitamin B_1 in human diets, A. Z. BAKER and M. D. WRIGHT (*Roy. Soc. Med.* [*London*], *Proc.*, *29* (*1936*), *No. 9, pp. 1145–1154; Fr., Ger. abs., p. 1146*).—An evaluation was made of the vitamin B_1 content of some well-chosen adequate diets in common use, selected special diets, and sample diets associated with beriberi disease. The results of the survey showed that the vitamin B_1 values of the very low, moderately low, and borderline diets were 71, 90, and 264 international units, respectively. The British Medical Association diets for adults contained 212 and 440 units and over, for children of from 3 to 6 yr. of age 298 units, and from 6 to 8 yr. of age 264 units of vitamin B_1. Sample high vitamin diets contained between 693 and 1,012 units of vitamin B_1. Cases of beriberi were discovered in adults on diets containing 400 units or more, therefore the 200-unit level cannot be considered sufficient for adequate protection in all cases. From 200 to 300 international units may be taken as the protective level for an adult, depending on the body weight and the food consumption. During pregnancy and in digestive disorders the vitamin B_1 intake is particularly important. Children's diets should be relatively higher in vitamin B_1 than those of adults.

Neuritis in pregnancy successfully treated with vitamin B_1, G. W. THEOBALD (*Lancet* [*London*], *1936*, *I*, *No. 15, pp. 834–837*).—Five pregnant patients

suffering from gestational neuritis, of which the symptoms were described as numbness, tingling, and pins and needles of the arms, hands, and legs and insomnia due to the pain, were successfully treated by dietetic measures, particularly by the administration of vitamin B_1 preparations. Amounts varying from 1,500 to 2,850 vitamin B_1 units were given daily. Two cases showed a deficiency of vitamin D in their diets, and in other cases vitamin A and calcium were given.

The carotene content of some Indian vegetable food-stuffs, with a preliminary note on its variation due to storage, I, II, N. K. De (*Indian Jour. Med. Res., 23 (1936), No. 4, pp. 937–948*).—This investigation, which is part of a survey of Indian foodstuffs, is concerned with the carotene content of about 80 green leafy vegetables, roots, fruits, legumes, and cereals.

In part 1 a modification of the spectrophotometric method of assay was employed on products purchased in the open market. The tabular figures, giving the carotene content in γ per gram or cubic centimeter of material, show that the green leafy vegetables are in general rich sources of carotene, as are the fruits tested in the green state. The cereals and legumes analyzed were not as rich in carotene. That photochemical activity plays a role in carotene synthesis in plants was demonstrated, leaves of cabbage being about 40 times as rich in carotene as the inner white portion. Carotene was present in much larger quantities in the skin of the orange or lime than in the juice or inside portion, the comparative figures reported being 25.7γ per gram of skin and 4.2γ per cubic centimeter of juice.

In part 2 some vegetable foodstuffs were kept in baskets or jars at various temperatures. The carotene content of some nonleafy vegetables did not change significantly during a reasonable storage period, but some of the pulses, roots, and fruits showed a steady increase of carotene content during mild or cold storage. The green leafy vegetable amaranth showed a definite lowering of carotene content after short storage.

Factors affecting the carotene content of certain vegetable food-stuffs, N. K. De (*Indian Jour. Med. Res., 24 (1936), No. 1, pp. 201–212, figs. 3*).—The author studied the variations of the carotene content in edible leafy vegetables during storage under various conditions and as a result of milling, parboiling, cooking, and sprouting.

Leafy vegetables lost carotene in storage under ordinary conditions at all temperatures, the rate of loss being greater at higher temperatures. It would appear that the rate of destruction gradually decreases as the materials become dried. Green vegetables sprinkled with water and wrapped in a wet cloth retained a high carotene content for several days. Highly milled rice was found to be completely devoid of carotene. Parboiling caused a slight loss of carotene. No loss occurred in vacuum-dried green leaves at 100° C., with comparatively rapid loss occurring when the fresh leaves were exposed to diffused sunlight. Carotene losses resulted when green leaves were preserved under water, especially when the fat solvent toluene was added to prevent mold or bacterial action. This loss could be largely prevented in the presence of carbon dioxide gas. Very slight loss of carotene occurred when formaldehyde was added to the water containing green vegetables.

Studies on the effect of cooking showed that the leafy vegetables and potatoes lost very little or no carotene on boiling, while appreciable amounts were lost from the legumes. After 45 min. of boiling rice lost 100 percent of its carotene content. A gradual loss of carotene occurred during the sprouting period.

Absorption of carotene, W. Heymann (*Amer. Jour. Diseases Children, 51 (1936), No. 2, pp. 273–283, fig. 1*).—The author studied the diminished absorption of carotene in the intestinal tracts of five children showing skin discoloration

Using a 3-day period, he determined the carotene content of the blood serum and feces, and, assuming that carotene not recovered in the feces was absorbed, he concluded that an increased destruction of carotene within the body tissues accounted for the skin discoloration.

To study the absorption of carotene during infections, 24 healthy infants and 17 infants suffering from infections were observed. Healthy infants absorbed the carotene in oil to the extent of about 70 percent, while the infants suffering from infections showed a diminution in the rate of absorption to an average of 35 percent. As the lowered rate of absorption was observed during a 2-week period after the last day of fever, the fever alone was not the cause. In 6 healthy infants and 5 infants suffering from infections, it was found that infections did not interfere with the rate of absorption of total fat. That the carotene content of the serum rises more slowly in infants suffering from infections was demonstrated with 9 infants receiving daily doses of carotene in oil.

The vitamin C content of Szechwan fruits and vegetables, Y. T. Chang and H. B. Collier (*Chin. Jour. Physiol., 10 (1936), No. 3, pp. 435–444*).—The methods of Birch et al. (E. S. R., 70, p. 741) and of Bessey and King (E. S. R., 71, p. 137), with some modifications, were applied in the determination of the vitamin C content of about 50 samples of Szechwan fruits and vegetables. The citrus fruits gave results similar to those obtained by workers in other parts of the world, the orange, tangerine, lemon, and pomelo being of approximately equal potency. The authors report a "hairy pear" (*Actinidia chinensis*) containing an abundance of ascorbic acid (1 mg per gram). Cress, alfalfa, shepherds-purse, cauliflower, and coriander are good sources of ascorbic acid, the content ranging from 0.3 to 1.1 mg per gram of the samples.

[Vitamin C potency of vegetables] (*New York State Sta. Rpt. 1936, p. 39*).—This progress report (E. S. R., 74, p. 887) summarizes studies on the occurrence and stability of an ascorbic acid oxidase in vegetables and on factors affecting the vitamin C content of the important commercial varieties of the common vegetables.

Vitamin C content of vegetables.—I, Spinach, D. K. Tressler, G. L. Mack, and C. G. King (*Food Res., 1 (1936), No. 1, pp. 3–7*).—The study reported in this contribution from the New York State Experiment Station was undertaken to obtain data on the relative importance of variety, freshness, maturity, and soil on the ascorbic acid content of spinach, as determined by the Bessey and King technic (E. S. R., 71, p. 137). Biological assays were also made on two samples, the antiscorbutic values being determined by the curative type of testing. Since preliminary tests had shown that the stems are almost devoid of ascorbic acid, the experiments were made on the contents of the leaves.

The freshly cut leaves of the Prickly Winter variety had an ascorbic acid content of 0.72 mg per gram before maturity, 0.75 mg at nearly full growth, and 0.78 mg per gram after beginning to bolt. Similar values for the Hollandia variety were 0.78, 0.75, and 0.79 mg per gram, respectively. These values indicate that the ascorbic acid content of spring spinach leaves is nearly constant during the growth period. Leaves of the spinach cut as for market and kept at room temperature for 3 days lost approximately one-half of the ascorbic acid content, while duplicate samples kept at from 1° to 3° C. retained practically all of the ascorbic acid. This demonstrates the importance of refrigerating spinach soon after cutting.

The leaves of 12 varieties grown on upland soil averaged 50 percent higher in vitamin C content than those grown on muck soil and harvested the same day. The variety with the highest value on muck soil was Eskimo, 0.62 mg per gram, and on upland soil Broad Flanders, 0.89 mg per gram. Princess

Juliana gave the lowest value on both soils, 0.38 and 0.53 mg per gram on muck and upland soils, respectively.

Biological determination of the proportion of antiscorbutic vitamin (vitamin C: ascorbic acid) in twelve of the chief varieties of apples cultivated in Sweden [trans. title], G. F. GÖTHLIN (*K. Landtbr. Akad. Handl. och Tidskr., 74 (1935), No. 7, pp. 884–962, pls. 16, figs. 36; Eng. abs., pp. 940–942*).—Taking as the criterion of complete protection against scurvy the presence of a normal microscopic structure in the lamellae of the guinea pig's molar teeth, the author measured the vitamin C content of 12 varieties of apples by determining the lowest "micro" preventive dose against scurvy in the guinea pig. Employing the same method, the lowest micro preventive dose of pure ascorbic acid was set at 1⅓ mg resorbed ascorbic acid. The quantity of ascorbic acid resorbed in the alimentary canal per 100 g of peeled apple consumed was calculated, using this figure (1⅓ mg). The results of the determinations, expressed in milligrams of resorbed ascorbic acid, are as follows: Bramley Seedling 22 mg, Yellow Richard 13, Belle de Boskoop 13, Ribston 8, Signe Tillisch 7, Melon apple 5, Cox Pomona 5, Grawensteiner 5, Grågylling 4, Oranie 3.5, Åkerö 3.5, and Säfstaholm 2 mg.

From these results the Bramley Seedling, Yellow Richard, and Belle de Boskoop would be suitable additions to the children's winter diet with a view to preventing a shortage of vitamin C. This study shows that Swedish apple growers can produce apples that contain at least 5 mg of ascorbic acid per 100 g of apple, and the author suggests that from the vitamin point of view the Grågylling, Oranie, Åkerö, and Säfstaholm are hardly worth cultivating.

The effect of diets and various substances on the vitamin C content of some organs of the rat, J. L. SVIRBELY (*Amer. Jour. Physiol., 116 (1936), No. 2, pp. 446–455*).—An investigation was made of the distribution of vitamin C in the organs of the rat to gain further information regarding the probable site of the synthesis of ascorbic acid and the nature of its precursors. Thirty-eight young albino rats of inbred strain were grouped and placed for definite time periods on test diets of varying composition: Vitamin B complex-deficient, vitamin B_1-deficient, vitamin B_2-deficient, and varying amounts of carbohydrate and casein. All diets were fed liberally to prevent inanition.

The results show that the rat is capable of synthesizing vitamin C regardless of the general composition of the diet. Normal vitamin C values were found in the organs of rats receiving adequate vitamin B factors in the diet. The ability of the body tissues to use ascorbic acid was increased when desiccated thyroid gland or α-dinitrophenol was given. The vitamin C content of the organs was decreased when sodium fluoride was administered with the desiccated thyroid gland. The rats to which ether or cincophen was administered showed a decreased vitamin C content of the liver. Evidence is given of the role played by the small intestine in yielding primary precursors for the synthesis of vitamin C.

Milk not potent for cevitamic acid (*Jour. Amer. Med. Assoc., 107 (1936), No. 10, pp. 792, 793*).—This editorial shows that milk, fresh or pasteurized, cannot be considered a rich source of cevitamic acid. On the basis of recent findings, if milk containing 25.9 mg cevitamic acid per liter were the sole source of cevitamic acid in the diet, the average adult man weighing 60 kg would need considerably more than 1 l of milk daily for optimum protection. The preschool child would require over 4 l daily and the nursing infant would need almost 2 l daily of milk for adequate protection against scurvy.

The rôle of the thyroid in the calorigenic action of vitamin D, H. DEUTSCH, C. I. REED, and H. C. STRUCK (*Amer. Jour. Physiol., 117 (1936), No. 1, pp. 1–5, fig. 1*).—The basal metabolism rate was determined on two normal dogs before

thyroparathyroidectomies were performed. One dog showed a postoperative increase in the metabolic rate for 3 days, followed by a definite decline. The other dog demonstrated immediately a decrease in the metabolic rate approximately parallel with a decline in body weight. Large doses of vitamin D were administered to the two experimental animals and to two normal animals, but no marked augmentation in the metabolic rate of the experimental animals comparable to that produced in the normal animals receiving vitamin D was produced. The metabolic rate was restored approximately to the original level when the body weights of the experimental animals returned to normal. Since no explanation can be given for this effect of vitamin D, the authors are now investigating whether the thyreotropic effect is due to direct action of vitamin D on the thyroid or to indirect action through the anterior lobe of the pituitary gland.

Vitamin G concentrates as preventives against black-tongue, with parallel studies of the same concentrates in the diets of white rats, L. E. Booher and G. H. Hansmann (*Amer. Jour. Physiol., 114 (1936), No. 2, pp. 429–435, figs. 2*).—The use of a vitamin G concentrate for the prevention of blacktongue in dogs and the growth-promoting properties of the concentrate when fed to white rats were investigated. The Goldberger diets Nos. 123 and 324, with slight modifications, were fed (E. S. R., 63, p. 491). The vitamin G concentrate, which was obtained from low-lactose whey powder, contained both vitamin G (lactoflavine) and one or more factors of the vitamin B complex. This substance proved effective in the prevention or cure of blacktongue in the seven experimental dogs, 200 mg per kilogram of body weight per day being sufficient for protection. When the concentrate was fed to white rats receiving the same diets as those of the dogs, better growth was noted in the group being fed diet 324 (which has a higher protein content), supplemented by the concentrate. An inferior rate of growth was shown by those rats which were fed the diets without the addition of the concentrate.

Reversion of cardiac enlargement in a four year old child following treatment for avitaminosis, L. Rabinowitz and E. J. Rogers (*New England Jour. Med., 215 (1936), No. 14, pp. 621–623, figs. 2*).—The authors present a case of a 4-year-old child with a cardiac enlargement who exhibited symptoms of scurvy, rickets, and possibly beriberi. After a 4-mo. period of proper feeding with adequate amounts of vitamins B, C, and D, all the symptoms of the cardiac enlargement and heart disease, as well as the avitaminosis, disappeared.

Further studies of viosterol in the prophylaxis of rickets in premature infants, L. T. Davidson, K. K. Merritt, and S. S. Chipman (*Amer. Jour. Diseases Children, 51 (1936), No. 3, pp. 594–608, figs. 2*).—In this investigation, 27 premature infants under constant clinical supervision were given viosterol, 3,150 U. S. P. units daily from the eighth day of life, as the only source of the antirachitic substance. All infants except 2 were breast-fed and at weaning time were placed on nonirradiated evaporated milk. One infant was entirely breast-fed, and 2 received nonirradiated evaporated milk from birth throughout the experiment. The infants did not have sun baths. Roentgenograms of the forearm and wrist were made through the sixth month. The calcium and inorganic phosphorus contents of the serum were also determined monthly. Clinical data collected included observations for signs of rosary, Harrison's groove, enlarged epiphyses, changes in cranial bossae, and craniotabes.

Clinical evidences of rickets were absent in 10 infants. The remaining 17 showed considerable variation in the clinical manifestation of the mildest form of rickets. Craniotabes was found more generally in this group of infants than in any group previously reported on. Except in 2 infants, the values for calcium and inorganic phosphorus contents of the serum were at high normal

levels. This finding substantially verifies the previous claim of these authors that mild degrees of rickets may be observed clinically and by roentgenograms, although the calcium and inorganic phosphorus contents of the serum are normal. Roentgenogram examinations showed that 9 of the infants were not rachitic, but a very mild form of rickets was demonstrated in the other 18, appearing in the third month and being satisfactorily healed in the fifth to the sixth month.

Vitamin deficiency in prescription diets of diabetics, A. SINDONI, JR. (*Amer. Jour. Digest. Diseases and Nutr.*, *3* (*1936*), *No. 10*, *pp. 759–765*).—The author investigated the relationship of diet deficiency to symptomatology as observed in 85 diabetics aged from 11 to 77 yr. Approximately 48 percent of the patients were obese, and all suffered from symptoms other than diabetes. The food habits were studied during the period prior to the patients' knowledge of the onset of diabetes. Data were compiled on the foods prohibited and permitted by the family physician during the diabetic period, the duration of symptoms, insulin therapy, weight changes, blood chemistry, and complications.

During the "prediabetic" period 56 percent of the group did not drink milk, 23 excluded fruits, and 13 percent excluded vegetables from their diets. A few vegetables were eaten by 17 percent, 40 percent ate pastry, candy, or sugar, a proportionately large quantity of bread was eaten by 45 percent, 32 percent were overeaters, and all ate their meals irregularly. During the diabetic period none adhered to their prescribed diets, in which fruits, many vegetables, and cereals were prohibited and milk, eggs, meat, and fish were restricted. Special diabetic preparations such as gluten bread were prescribed for 31 percent of the patients. Insulin was administered in 42 percent of the cases.

Avitaminosis and hypovitaminosis were found in all patients. A marked correlation was noted between the vitamin-deficient diets and a rise in the incidence of diabetes, diabetic complications, or concurrent diseases. The incidence of diabetes or concurrent diseases was not related to overeating.

During a period varying from 10 days to 14 mo., any physical disturbances which might interfere with food metabolism were corrected and the patients were placed upon a diet composed of from 100 to 180 g of carbohydrate, from 60 to 80 g of protein, and from 80 to 120 g of fat. Natural, vitamin-rich foods, including vitamin D milk, were supplied, and hygienic measures such as exercise and proper body care were advocated. All the patients showed better adherence to the natural food diet, with a marked metabolic improvement and a reduction or alleviation of the symptoms other than diabetes. The obese patients returned to approximately their normal weights. Insulin administration was discontinued or reduced in 80 percent of the insulin group, and increased in the remaining 20 percent. In 1.6 percent of the group not receiving insulin previously, administrations were given to maintain blood sugar values optimum for their age. The majority of the patients showed less fluctuation in the blood sugar level. Other advantages of the dietary treatment were greater resistance to infection, more energy, and a better outlook upon life.

Anaemia in pregnancy, J. A. BOYCOTT (*Lancet* [*London*], *1936*, *I*, *No. 21*, *pp. 1165, 1166–1171, 1172*).—Of 222 unselected patients attending an antenatal clinic, 78 percent had greater than 80 percent hemoglobin, 22 percent less than 80 percent, and 11 percent less than 70 percent as determined with the Haldane hemoglobinometer. Detailed examination of 26 cases with hemoglobin less than 80 percent showed this group equally divided into those with normal and those with subnormal color indexes. Evidence indicated in some cases an

inconsistent increase in plasma volume causing, by the dilution of red cells and hemoglobin, an apparent anemia with normal color indexes. This condition might coexist with the true or with the hypochromic type, which is the common anemia of pregnancy and is due to an iron deficiency. The latter type responded well to adequate iron treatments except in cases with a complicating disease. Evidence further showed that factors which usually caused anemia also contributed to producing anemia in pregnancy. The data did not prove that social status, age, or parity affected the incidence of anemia. A list of 53 references to the literature is given.

The antianaemic principle of liver, H. B. Sreerangachar and M. Sreenivasaya (*Cur. Sci.* [*India*], *4* (*1936*), *No. 7, pp. 468–472*).—This paper is a discussion of the etiology and treatment of pernicious anemia. A review is given of the work of preparing an active liver extract for treating anemia and on the studies made on the nature of the active principle in the extract. The merits of a satisfactory biochemical assay for determining the potency of liver preparations are stressed in view of the present slow method of assaying by treating human anemia.

New outbreaks of botulism in western United States, I. C. Hall (*Food Res.*, *1* (*1936*), *No. 2, pp. 171–198, fig. 1*).—From June 1932 to January 1936, 5 outbreaks were reported in Colorado, 4 in Montana, 3 in New Mexico, 1 in South Dakota, and 1 in Nebraska. The survey covers 13 families composed of 71 persons of whom 39 became ill and 32 died. The incidence of botulism was highest during those months when home-canned foods are most generally used. From the evidence presented only home-canned vegetables were involved, in 6 cases the toxin being present in canned cauliflower, chili, beet tops, and sweet corn. In 7 outbreaks neither toxin nor *Bacillus botulinus* could be demonstrated, but epidemiological data indicated that these cases were probably due to home-canned string beans, beets, and spinach. Two of the outbreaks were ascribed to "pressure-cooked" products. The author believes that no reliance can be placed on autoclave or pressure cookers which are not provided with separate pressure gauges and thermometers.

The chemical composition of teeth.—I, The estimation of fluorine and the fluorine content of normal teeth, J. H. Bowes and M. M. Murray (*Biochem. Jour.*, *29* (*1935*), *No. 1, pp. 102–107*).—An extensive review, with 41 references, is given of the methods used in recent years to determine small quantities of fluorine. Applying the zirconium-alizarin method to solutions of tooth material, the authors found that human enamel around London contained 0.02 percent fluorine and that the teeth of rats not on fluorine-free diets contained from 0.02 to 0.03 percent.

Studies in the rat of susceptibility to dental caries: A review of four years of research, T. Rosebury, M. Karshan, and G. Foley (*Jour. Amer. Dental Assoc.*, *22* (*1935*), *No. 1, pp. 98–113*).—In this group research, the first attempts to produce dental caries experimentally in rats were based on dietary deficiencies of calcium and vitamins D and C, on a diet high in carbohydrate, and on administration of cultures of oral human *Lactobacillus acidophilus*. This experimental procedure did not result in producing fissure lesions in rat molars identical with the caries of human beings, but such fissures were successfully produced by feeding coarsely ground brown rice or corn (in contrast to finely ground and cooked cereal), dextrin, and spinach. Fracture lesions previously identified with calcium-vitamin D deficiency were also noted in the teeth of these rats. Better calcification and improved tooth structure were obtained when the diet was corrected by adding calcium, phosphorus, and vitamin D, singly or in combination, but these food factors did not prevent tooth decay.

In explanation of the results, the writers suggest that the fissure lesions are produced by coarse particles of the cereal impacting on the molar cusps, and that poor tooth structure results from dietary deficiencies which may be factors in causing the tooth to be susceptible to decay.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1936, pp. 9, 10*).—This annual report of the Textiles and Clothing Division (E. S. R., 74, p. 732) includes summaries of a completed investigation in cooperation with the Bureau of Animal Industry on the deterioration during use of woolen blankets of known fiber and construction, and progress reports of studies on the suitability of various starches (particularly sweetpotato starch) for cotton fabric finishing.

Strength produced in different fabrics by various starches and modified starches, M. S. FURRY (*Jour. Home Econ., 28 (1936), No. 10, pp. 687–690*).—In studies at the U. S. D. A. Bureau of Home Economics, seven cotton fabrics of various weights and construction were sized with different starches, and the increase in their strength was measured by breaking strength determinations. To eliminate any variation due to the construction of the fabric, different concentrations of starch were used in samples of longcloth, and the results of the strength tests and elongation measurements were compared. The samples of fabrics, washed free of finishing material, were immersed in the starch pastes at 87° C. for 3 min., put through a wringer, and stretched on a wooden frame to dry.

The breaking strength determinations showed that potato, canna, and sweetpotato starches had the greatest strengthening effect, followed in order by corn, rice, dasheen, and wheat starches, and by 4 commercial cornstarches which had been partially hydrolyzed. On longcloth fabric sized with starch pastes of various concentrations the potato and canna starches gave the greatest strength, followed in order by corn, rice and dasheen, and wheat starches. Elongation measurements taken at the breaking load of the sized fabrics showed that fabrics sized with potato, corn, and canna starches stretched the least, followed in order by rice, dasheen, and wheat starches. These results demonstrate that various kinds of starches used in sizing cotton yarns or in finishing cotton fabrics produce differences in the properties of the yarns and fabrics.

The effect of laundering upon the appearance and wearing quality of some blanket fabrics, C. JACKSON and K. CRANOR (*Amer. Dyestuff Rptr., 25 (1936), No. 16, pp. 443–449, figs. 10*).—Samples of all wool 3-lb. single blankets were subjected to laundering tests under varying conditions. The effect of finishing was determined on a length of the unfinished blanket fabric. Before and after laundering the fibers were examined microscopically, and physical tests were made to determine tensile strength, elongation, width, weight, and thickness of the fabric, yarn count, yarn twist, length of staple, diameter of fiber, and number of fibers per yarn for warp and filling. Samples of the fabrics were washed in a vacuum type commercial washing machine, a launderometer, a hand suction dasher, a vacuum cup type, and two gyrator types of washing machines, rinsed, and dried at temperatures ranging from 85° to 120° F.

The best results in laundering an all wool blanket were obtained by washing for 3 min. in neutral soapsuds, using the hand suction dasher or the low speed vacuum cup washing machine, rinsing, and drying the fabric at room temperature. The greatest amount of shrinkage and destruction of the nap

resulted from excessive launderings in very hot water, with the application of friction. The durability and breaking strength of the blankets had been decreased in the process of napping to gain a high, thick, soft nap and to give the greatest heat-retaining property. The resulting fabric was not strong enough to withstand wear and laundering.

HOME MANAGEMENT AND EQUIPMENT

Household equipment [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1936, pp. 11–13*).—This progress report of the Division of Household Equipment (E. S. R., 74, p. 732) includes data on fuel consumption and speed of cooking various foods both on the surface burners and in the oven of a well-insulated coal range of unusual construction, on oven temperatures and speed of heating in the oven and on a surface burner of a low-cost gas range, and on no-load performance tests of kerosene-operated and ice-cooled refrigerators of the newer types.

Better buymanship.—No. 20, Home heating, P. E. Mohn (*Chicago: Household Finance Corp., [1936], pp. 38, figs. 5*).—A large amount of practical information, much of it of a technical character, is presented on home heating. This relates to fuels, fuel selection, reducing fuel costs by proper construction, and the selection and installation of heating plants.

Vacuum cleaning, E. H. Roberts (*Washington Sta. Bul. 336 (1936), pp. 24, figs. 2*).—Four series of tests were made with nine electric vacuum cleaners on naturally soiled Axminster, Wilton, and velvet rugs, following practically the procedure described by Dilts (E. S. R., 72, p. 574). The cleaners were operated at a speed of approximately 1 ft. per second with the motor set at high speed. Weight determinations were made on the rugs, and the dirt collected in the bag was separated to determine the amount of nap removed.

The three types of rugs were found to be very similar in cleaning characteristics. The vacuum cleaners using suction with motor-driven brush showed an average dirt removal of approximately 84 percent during the 2-min. test period, as compared with approximately 58 percent for the cleaners using straight suction. Further tests on the effect of time in cleaning also demonstrated that the weight of dirt removed in 2 min. by the action of the former cleaner was equal to the amount removed by the latter cleaner in 4 min. The percentage of nap removal varied with the individual cleaners and type of rug. Unsatisfactory results were obtained when the tests were repeated in several homes and the performance of the test cleaners compared with those of the housewives' cleaners. The necessity of keeping the cleaner bag clean was not appreciated by most of the housewives.

The author concludes that the wearing action of a vacuum cleaner on a rug is minor when compared with the wear of normal use, and that the cleanness of the inner surface of the bag is one of the most important factors for effective vacuum cleaning. Also the time needed for efficient cleaning appears to be a better buying criterion than the price of the vacuum cleaner.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1936, H. A. Wallace (*U. S. Dept. Agr., Sec. Agr. Rpt., 1936, pp. IV+115*).—The principal findings in this report are noted elsewhere in this issue.

Forty-eighth Annual Report [of Arkansas Station], 1936, **C. O. Brannen et al.** ***(Arkansas Sta. Bul. 337 (1936), pp. 73, figs. 2).*—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.**

Forty-ninth Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1935, W. L. SLATE ET AL. (*Connecticut [New Haven] Sta. Rpt. 1935, pp. [903], pls. 8, figs. 180*).—In addition to the usual administrative data, this report contains reprints of Bulletins 377–389, noted previously or elsewhere in this issue, and of the following circulars: Nos. 107, Windsor-A, a New Sweet Pepper, by L. C. Curtis (pp. 1–7); 108, Connecticut Laws Concerning Plant Pests, Diseases of Bees, and Mosquito Elimination, by W. E. Britton (pp. 9–16); 109, Control of the Mexican Bean Beetle in Connecticut, by N. Turner and R. B. Friend (pp. 17–24); 110, Requirements for Tree Workers in Connecticut (pp. 25–36); 111, Control of the White Apple Leafhopper, by P. Garman and J. F. Townsend (pp. 37–47); 112, Sweet Corn Inbreds, by W. R. Singleton and D. F. Jones (pp. 49–58); 113, Lawn Management, by M. F. Morgan, E. M. Stoddard, and R. B. Friend (pp. 61–70); 114, Insecticides to Control the European Corn Borer, by N. Turner (pp. 73–76); 115, Law and Regulations Concerning the Inspection and Shipment of Nursery Stock in Connecticut, by W. E. Britton (pp. 77–84); and 116, Regulations Concerning Transportation of Nursery Stock in the United States and Canada, compiled by W E. Britton (pp. 85–110). A tribute to the late Dr. L. B. Mendel (E. S. R., 74, p. 893) is also included.

***Annual report of the director [of the Delaware Station] for the fiscal year* ending June 30, 1935,** C. A. MCCUE ET AL. (*Delaware Sta. Bul. 203 (1936), pp. 42*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

***Report of the Michigan Agricultural Experiment Station for the two years* ended June 30, 1936,** V. R. GARDNER (*Michigan Sta. [Bien.] Rpt. 1935–36, pp. 61*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Work of the [Missouri] Agricultural Experiment Station, [1935], F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 370 (1936), pp. 100, fig. 1*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Service to Montana's livestock industry: The Forty-second Annual Report of the Montana Agricultural Experiment Station, [1935], F. B. LINFIELD (*Montana Sta. Rpt. 1935, pp. 60, figs. 22*).—In addition to the usual administrative data and a meteorological report for 1935 (pp. 54, 55), this report is devoted mainly to a discussion of the station work relating to livestock. The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-fifth Annual Report of the New York State Agricultural Experiment Station, [1936], U. P. HEDRICK (*New York State Sta. Rpt. 1936, pp. 114*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological records at the station, 1883 to 1935, inclusive, are appended (pp. 103–114).

NOTES

Arizona University and Station.—Six greenhouse units, together with a head house, are being completed for the use of the various departments in the College of Agriculture.

A. A. Nichol, assistant professor of range ecology and acting head of the department, has been granted a year's leave of absence to accept a Rocky Mountain sheep fellowship provided by the National Association of Audubon Societies.

Kansas Station.—New appointments include the following assistants: J. C. Frazier in plant physiology to devote major attention to a study of the physiology of the bindweed plant, Dr. Ralph M. Conrad in chemistry to study the proteins of the egg in cooperation with the department of poultry husbandry, and Catherine Mitchell in animal husbandry to assist with the compilation of records.

Louisiana University and Station.—Dr. A. H. Groth, assistant professor of physiology and assistant pathologist with the Colorado College and Station, has been appointed assistant professor of animal pathology, effective February 1. For the present he will devote his entire time to research, but beginning July 1 it will be about equally divided between research and teaching.

Minnesota University and Station.—A State potato improvement association has been formed with an initial membership of 120 and headquarters at University Farm. Its purpose is to improve the potato crop through the spread of information to growers, selection and breeding for increased yield and better quality, aiding in the testing, introduction, and distribution of new varieties, and serving as a clearing house for ideas on problems affecting the industry.

Julius Romness, since 1925 instructor and assistant professor of agricultural physics and assistant in the station, died January 22. He had given special attention to problems in rural electrification.

Missouri Station.—A new greenhouse has been built as a Works Progress Administration project at a cost of $14,000. About 3,000 sq. ft. of space will thereby become available for investigations in plant pathology, plant physiology, and general botany. A two-story storage unit has also been built at a cost of $1,500, and will be used for the soils and crops departments.

The station has been designated to receive the assets of a foundation recently established by J. C. Penney, a native of Missouri. Under the provisions, the Foremost Guernsey Association, Incorporated, has been endowed with approximately $300,000, in addition to 1,000 acres of land near Hopewell Junction, N. Y., 352 head of Guernseys, and buildings and equipment. The association is to engage in a long-range program of practical and scientific research intended to advance dairying practices and the development of Guernseys. Before or at the termination of a 60-year period, however, all assets will be turned over to the station.

Nebraska University and Station.—J. C. Russel resigned February 1 as professor of agronomy in charge of soil research in the station, but is con-

tinuing as assistant regional director for rural resettlement with the U. S. Resettlement Administration.

North Dakota Station.—Dorothy G. Berrigan, assistant in home economics, resigned April 1.

Pennsylvania College and Station.—The buildings of the Regional Laboratory for Pasture Research (E. S. R., 75, p. 3) are nearing completion. It is planned to dedicate the laboratory May 4, when representatives of the Department and of the experiment stations of the Northeastern States will be present to discuss the future program.

Research in the interest of the fruit growing industry has been given an impetus by an enlargement of the work of the Arendtsville Field Laboratory in Adams County. Harold J. Miller has been appointed plant pathologist; L. C. Marston, Jr., of the University of Tennessee, entomologist; and Charles O. Dunbar of the Connecticut College, horticulturist. S. W. Frost, entomologist of the laboratory since its inception in 1918, has been transferred to State College.

The first unit of a new greenhouse range to be used for research is under construction.

A research forest of several thousand acres, 15 miles from the college, has been made available through the cooperation of the U. S. Resettlement Administration. A similar area adjacent to it has been provided for the Allegheny Forest Experiment Station.

Dr. S. W. Fletcher has resigned as head of the department of horticulture to devote full time to his duties as director of research. Warren B. Mack, professor of vegetable gardening, has been appointed head of the department.

Dr. J. E. Hunter, associate professor of agricultural and biological chemistry, has resigned to accept a commercial position. Dr. R. H. Sudds, assistant professor of pomology, has resigned to become assistant professor of pomology in the West Virginia University.

Edward S. Erb, associate professor in charge of agricultural analyses and meteorologist, died February 19 at the age of 59 years. A native of Pennsylvania, he was graduated from the college in 1901, received the M. S. degree in 1908, and has been associated with the chemical work since 1909.

Puerto Rico College Station.—Director F. A. López Domínguez has been given leave of absence for a year to assist in the work of the Puerto Rico Rehabilitation Administration. Dr. Melville T. Cook, phytopathologist, has been appointed acting director from March 3 to June 30.

Washington Station.—Harley D. Jacquot, formerly assistant at the Adams Substation and more recently with the U. S. Resettlement Administration, has been appointed acting superintendent of the substation.

Wisconsin University.—The Alumni Research Foundation (E. S. R., 63, p. 106) has appropriated funds aggregating $163,000 for the coming year to be used on both old and new research projects under the direction of faculty members. About 80 projects are now under way, selected and approved by the university research committee. The new allotment is an increase of $20,500, and is subdivided into $100,000 for grants-in-aid for equipment and maintenance for over 100 graduate research workers, $17,000 for faculty summer vacation research, $20,000 for special fellowships and scholarships, $7,500 for continuation of several post-doctorate fellowships, $10,500 as a printing fund under a university press to be established, and $8,000 for the continuation of work now under way on game management and land waste problems.

Necrology.—Dr. Oliver L. Fassig, widely known for his contributions to American climatology, died December 6, 1936, at the age of 76 years. A native of Ohio, he was graduated from the Ohio State University in 1882, and in 1899 was the first to receive the Ph. D. degree in meteorology from the Johns

Hopkins University. He became associated with the Weather Bureau in 1883, working for many years in Puerto Rico, and had nearly completed an elaborate monograph on the climate of that island. At the time of his retirement in 1932, he was Chief of the Climatological Division of the Weather Bureau. He was a voluminous writer, one of his early contributions being an account of the 1896 convention of German experiment stations (E. S. R., 8, p. 447).

Harry N. Vinall, senior agronomist in the U. S. D. A. Bureau of Plant Industry, died February 22 at the age of 57 years. A native of Iowa, he was graduated from the Kansas College in 1903 and received the M. S. A. degree from Cornell University in 1912. He had been associated with the forage crops work of the Department since 1909, specializing in pasture grasses and sorghums.

George L. Bidwell, chemist in charge of the cereal section of the U. S. D. A. Food and Drug Administration, died February 22. Born in New Hampshire in 1880, he was graduated from Tufts College in 1905 and served as instructor in Rhode Island College in 1906–7. He had been associated with the Department since 1908. He was active for many years in the Association of Official Agricultural Chemists and a member of the executive committee of the Association of American Feed Control Officials, Incorporated.

New Journals.—*The Palestine Journal of Botany and Horticultural Science* is being published at approximately 4-mo. intervals at Rehovoth, with W. Junk, Scheveningsche Weg 74, 's Gravenhage (The Hague), as sole agent for foreign countries. The initial number contains the following original articles: In English, The Present State of Botanical, Horticultural, and Sylvicultural Research in Palestine, With a Bibliography of Palestinian Botany (pp. 8–21), and Critical Remarks on the Value of Lloyd's Alcohol Fixation Method for Measuring Stomatal Aperture (pp. 43–47), both by the editor, H. R. Oppenheimer; On the Influence of Various Liquid Fixatives on Stomatal Behaviour, by M. Nadel (pp. 22–42); *Cuscuta monogyna* Vahl., by E. Hareubeny (pp. 48–50); and The Application of Respiration Poisons in the Cure and Prophylactic Treatment of the Living Tree, by R. Falck (pp. 70–92); and, in German, Hugo de Vries as Plant Physiologist, by H. R. Oppenheimer (pp. 51–69).

Annales Agricoles de l'Afrique Occidentale is being published quarterly, with business offices at 11 Rue Victor-Cousin, Paris, and editorial headquarters at Bingerville, Ivory Coast, Africa. Its aim is to deal with questions pertaining to the agriculture, silviculture, animal husbandry, and economics of west Africa, which is said to be without a periodical "exclusively devoted to agricultural questions." In addition to brief notes and numerous abstracts, the initial number contains the following articles: The Principal Nematodes, Myriapods, and Insects Parasitic on Cultivated Coffee in French West Africa, by A. Mallamaire (pp. 1–45); The Fruit Problem in West Africa, by P. Mulheim (pp. 46–67); Volunteer Coffee in the "Eucoffeae" Section, by R. Portères (pp. 68–91); The Rust of Coffee in Cameroun (Cameroons), by L. Roger (pp. 92–98); and The Spotting of Coffee Grains, by A. Fritz (pp. 99–109).

Revista de Agricultura is being published monthly by the Provincial Government of Habana, Cuba. The initial number consists largely of brief articles contributed by members of the staff of the University of Habana and others on various phases of Cuban agriculture.

Revista Algodoeira is being published monthly as the official organ of the Syndicate of Cotton Industries of Pernambuco, Brazil. The initial number contains several articles dealing with the history and development of cotton growing in Brazil and related topics.

U. S. GOVERNMENT PRINTING OFFICE: 1937

EXPERIMENT STATION RECORD

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SOME RECENT DEVELOPMENTS IN DOCUMENTATION

Documentation, according to the latest edition of Webster's New International Dictionary, is the "act of furnishing with documents." Of late the term has been applied with increasing frequency to the service of making available to would-be users copies of publications (or reproductions thereof) and other bibliographical material. In this latter sense, it has direct significance for research workers, educators, and extension workers in agriculture and home economics, and at least two recent developments in the field are of considerable general interest.

In this country the most important occurrence has been the organization of American Documentation Institute, Inc. This institute, set up as a Delaware corporation for educational, literary, and scientific purposes, resulted from a meeting in Washington, D. C., on March 13, 1937, attended by representatives of national councils, societies, libraries, and other groups. Among its aims, as set forth in the certificate of incorporation, are the following: "(*a*) To assemble, classify, reproduce, and distribute documents of all sorts in all fields of human activity; (*b*) to conduct, operate, and furnish services for the collection, preparation, distribution, and sale of information, articles, monographs, references, bibliography, compilations, illustrations, and reviews to individuals, to newspapers, periodicals, journals, magazines, to societies, libraries, educational institutions, archives, museums, research organizations, and to governments; (*c*) to copy and duplicate by photography, microphotography, lithography, blueprinting, printing, mimeographing, and other processes of reproduction and to reproduce, project, and transmit by electrical, photoelectric, radio, television, and other means books, journals, manuscripts, illustrations, and other materials in libraries, institutions, organizations, business offices, archives, museums, laboratories, research centers; * * * (*e*) to sponsor instigate, and conduct developments of all phases of documentation and reproduction of research materials in the fields of the physical,

natural, social, economic, historical, and other sciences, the humanities, and the general sphere of libraries and information services; * * * (*g*) to cooperate with journals, libraries, institutions, societies in the reproduction, publishing, preservation, and distribution of any documentary material, articles, manuscripts, and other written, illustrative, or photographic material."

The institute is thus very broadly chartered, but its immediate objective is "to develop and apply the new technic of microphotography to library, scholarly, scientific, and other material." The formation of an organization for this purpose has been in contemplation since the undertaking of documentation activities by a division of Science Service in 1935. Temporarily these activities have been implemented with grants from the Chemical Foundation and carried on with the cooperation of the U. S. Department of Agriculture Library, the Naval Medical School, the Bureau of the Census, the Works Progress Administration, the Library of Congress, and other agencies. The principal channel of operation has been through Bibliofilm Service, conducted by Science Service in cooperation with the Department of Agriculture Library, together with some auxiliary publication of material through microfilms in cooperation with leading scholarly and scientific journals.

Bibliofilm service was instituted on an experimental basis by the Department of Agriculture Library late in 1934. It was hoped to decrease interlibrary loans of publications by supplying directly to individuals film copies of scientific articles and also to extend the use of the library to isolated workers. In the beginning satisfactory projectors for reading the films were not available at a reasonable price, but nevertheless a favorable response was made to the new venture. In the fiscal year 1935 1,078 film copies were supplied, and in 1936 2,206 film copies.

On January 1, 1936, the business management of the service, the routine photography, and the experimentation in developing mechanism were taken over by Science Service under a cooperative agreement, the Library continuing to supply space, the publications to be filmed, and the bibliographical work connected with orders. Ultimately much success was obtained in devising microfilm viewers and other accessories. Both microfilm and photocopies for reading without optical aid were made available at nominal cost.

A second function attempted by Science Service—that of original issue, under what is termed auxiliary publication—was intended, according to its sponsors, "to break the log jam that now dams scientific publication in many fields, making it possible to put into the realm of accessible scientific literature material of all sorts that can not now be printed because of economic factors." Under its provisions, editors of participating journals or institutions deposit

typescripts of those papers or portions of papers they cannot publish promptly or completely. Microphotographs are then made, from which copies can be prepared as desired. Knowledge of the availability of the document is obtained chiefly by abstracts or other notices in scientific journals. This service has been found to have special possibilities in connection with theses and dissertations for which a limited circulation is reasonably adequate.

The documentation activities of Science Service are now to be transferred to the new institute. This is constituted as a distinct and independent entity, and its policies are still in the making. Presumably, however, the projects referred to will be maintained and developed, and additional ones of similar scope may be fostered as opportunity offers. If so, much useful service should be forthcoming. Among the advantages which should result from a permanent and centralized agency are a more standardized procedure and an increased inter-institutional cooperation.

Preparations are also being made for arousing interest and rendering assistance along much the same lines through a World Congress of Universal Documentation, projected "to promote the collective study and discussion of all questions relating to documentation." This Congress is to be held in Paris from August 16 to 21, 1937, under the auspices of an International Committee of Documentation. The American member of this committee is Mr. Watson Davis of Science Service.

A prospectus of the Congress calls attention to the fact, probably little known in this country, that an International Institute of Documentation has already been in existence for 40 years. Such agencies as the International Federation of Librarians Associations, the International Labour Office, the International Institute of Agriculture, and the International Office of Chemistry have also been giving it considerable attention. Nevertheless, as the prospectus states, "coordination, cooperation, joint and unified proceedings are still slow, whereas research workers demand the maximum efficiency in what is to be used by all as an intellectual tool." If the Congress is successful in bringing together representatives of the many interests which might benefit from an international organization of documentation—authors, societies, institutions, publishers, book sellers, libraries, and individual users—an interchange of views may result which can hardly fail to be stimulating as well as informative.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Technological chemistry and bacteriology at the California Station] (*California Sta. [Bien.] Rpt. 1935–36, pp. 121–126*).—This report touches briefly upon the processing of fruit, fruit juices, grape varieties for high-quality wines, refrigeration of wine, wine spoilage, important factors in wine making, utilizing winery wastes, olive processing, freezing storage of vegetables, and beeswax.

[Chemical studies by the Hawaii Station] (*Hawaii Sta. Rpt. 1936, pp. 50–55, 57, 58, fig. 1*).—These are described under the headings the sterols of tropical oils, by L. N. Bilger; iodine content of Hawaiian soils and rocks, by E. M. Bilger; and taro processing, by G. J. Ley, J. H. Payne, and [G. H.] Akau.

Quantitative investigations of amino acids and peptides, I, II, M. S. DUNN and A. LOSHAKOFF (*Jour. Biol. Chem., 113 (1936), Nos. 2, pp. 359–369, fig. 1; 3, pp. 691–694*).—These contributions are from the University of California at Los Angeles.

I. *Quarantine formol titration.*—The precision attainable in the analysis of amino acids and peptides was found to be ±0.1 percent. The method was found to have an inherent accuracy of ±0.1 percent. The probable effects of different types of impurities on the accuracy of the method are discussed.

The gain in accuracy over that attainable by procedures hitherto available is indicated in the statement that, in what the authors found to be one of the most satisfactory of the indicator titration methods, "under optimum conditions of indicator color and acetone concentration the average experimental error was approximately 0.5 percent."

II. *Apparent acid dissociation constants in aqueous formaldehyde solution.*—The apparent acid dissociation constants of a series of amino acids and peptides were determined for the following amino acids in 9 percent formaldehyde: *dl*-alanine, glycine, *dl*-norleucine, *dl*-phenylalanine, *dl*-serine, and *dl*-valine. Like data for seven dipeptides and one tripeptide were also obtained.

The isolation of a fourth crystallizable jack bean globulin through the digestion of canavalin with trypsin, J. B. SUMNER and S. F. HOWELL (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 607–610, figs. 2*).—Though they had been able to obtain three jackbean globulins (concanavalin A, concanavalin B, and an urease) in a crystalline condition, the authors of this contribution from Cornell University had not obtained unaltered canavalin in a crystalline form when crystals of a globulin previously unknown were found to have been deposited from a canavalin preparation contaminated by bacteria. They, discovered, however, that "if one adds 1 volume of 1 percent Fairchild's trypsin to 1 volume of 6 percent canavalin at pH 6.5 and maintains the solution at 37° [C.], crystals of the new globulin will begin to separate out after 1 or 2 hours. After incubation overnight the process will be finished. The yield of crystals is increased by cooling the warm solution. . . .

"The material gives a strong test for unoxidized sulfur and for tyrosine but gives no Hopkins and Cole test, whereas the original canavalin contains 0.2 percent tryptophan. Carbohydrate is absent. The isoelectric point of the crystals in 0.1 N acetate buffer is at pH 4.8, as determined by cataphoresis. The globulin is denatured incompletely by boiling, or by contact with 0.1 N sodium hydroxide. It is resistant to 0.1 N hydrochloric acid. It is hardly affected by incubation overnight at 37° with either pepsin or trypsin.

"The most interesting property of the new globulin is its solubility in distilled water at pH 6.5 and its insolubility in 0.2 to 1 percent sodium chloride. If one dialyzes the globulin until it is salt free, the crystals slowly dissolve. The solution thus formed will give a crystalline precipitate if one adds a small amount of sodium chloride or calcium chloride solution. Upon adding an excess of 5 percent salt solution the crystals dissolve. The globulin behaves in a similar manner on the acid side of the isoelectric point but not at the isoelectric point itself.

"It is not yet possible to say whether the new globulin exists as such in the canavalin fraction or whether it is formed de novo by the proteolysis of canavalin. It would appear reasonable that the action of trypsin is to digest away some protein which prevents the new globulin from crystallizing."

The influence of method of preparation and of cations on the isoelectric point of ovalbumin, E. R. B. Smith (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 473–478, figs. 2*).—According to the author, the nature of the crystallizing salt used in the preparation of egg albumin shows very little or no effect on the isoelectric point of the protein; the pH of the isoelectric point is linearly related to the ionic strength; the influence of each cation is roughly proportional to its valence, but each ion has a specific effect; and extrapolation to 0 ionic strength of the apparent values for the isoelectric point of ovalbumin, cataphoretically determined, in acetate buffers of a number of cations, gives an isoelectric point of pH 4.86±0.02.

An immunological study of the reduction of disulfide groups in proteins, D. Blumenthal (*Jour. Biol. Chem., 113 (1936), No. 2, pp 433–437*).—The author investigated the immunological effect of reduction and regeneration of disulfide groups. Horse serum albumin was chosen for this purpose because of its high content of cystine, none of which exists in the sulfhydryl form, and because some of its immunological relations have been worked out on a quantitative basis. Similar experiments were carried out with crystallized egg albumin. "This protein, in contrast to serum albumin, gives practically no color on treatment with cyanide and nitroprusside, and therefore appears to be incapable of yielding normally functioning sulfhydryl groups."

The reduced serum albumin was obtained by treating a solution of crystalline serum albumin with thioglycolic acid at pH 8. Crystalline egg albumin was treated with a 300-fold excess of cysteine at pH 8 in the presence of a trace of ferric chloride. Reoxidation was effected in both cases by means of hydrogen peroxide.

In the case of the serum albumin "the effect upon the precipitin reaction of reduction and reoxidation reveals itself in two distinct ways. Firstly, the absolute amount of nitrogen precipitated is definitely less in the cross reaction than in the homologous precipitin determination. It may be pointed out that qualitative precipitin tests would scarcely have yielded this information. Secondly, the usual inhibition of precipitation by excess of test antigen is not found; on the contrary, there is a slight but steady increase of precipitate as the excess of antigen is increased." No notable differences in immunological behavior between the native, "reduced", and "reoxidized" forms of egg albumin could be detected. "With egg albumin, the failure of treatment with cysteine to

induce immunological differences correlates with the failure of the cyanide-nitroprusside test for sulfhydryl; on the other hand, the difference observed with heat-denatured egg preparations correlates with the appearance of sulfhydryl groups on coagulation by heat."

"These results indicate either that the S—S and —SH groups may be among the specific chemical groups involved in antigen-antibody combination, or that the reduction of the S—S linkage may split the antigen molecule into units which are too small to give the same immunological response as the original protein."

Lactoflavin, a possible contaminant of vitamin-free diets, G. C. Supplee, G. E. Flanigan, Z. M. Hanford, and S. Ansbacher (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 787–792, pl. 1*).—The authors express the belief that lactoflavin "is a contaminant of crude or commercial caseins and even of certain 'purified vitamin-free caseins.' Extraction of dry commercial caseins with weak acetic acid and alcohol for extended periods fails to eliminate all of the contaminating lactoflavin. Its presence in the 'purified' product may be readily revealed by examination in 'black light' under proper conditions.

"A process of preparing vitamin-free casein, involving a six-step elution treatment with weak sodium chloride solution at the isoelectric point of the casein, results in a product entirely free from lactoflavin."

The relative lactoflavin contents of various caseins and water-soluble vitamin concentrates were correlated with their growth-promoting properties.

The hydrolysis of starch by hydrogen peroxide and ferrous sulfate, W. R. Brown (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 417–425*).—It has been found that the action of hydrogen peroxide and ferrous sulfate upon starch is a hydrolysis, producing, in the course of the reaction dextrins, sugars of high molecular weight, and simple sugars. "The reaction is analogous to that produced by amylase, differing only in the fact that the simple sugars produced are further hydrolyzed and oxidized to acids and aldehydes. The reaction appears to be a true catalysis, the iron acting to transfer energy from the peroxide break-down to the starch molecule, thus raising the energy level of the starch and causing it to be reactive."

Technical aspects of emulsions (*London: A. Harvey, 1935, pp. [5]+150, figs. [21]*).—Several of the following chapters bear more or less directly upon phases of agricultural technology:

Foreword, by F. G. Donnan; On the Mechanism of Emulsification, by H. Freundlich; The Use of Highly Dispersed Emulsions in the Treatment of Toxaemic Conditions, by V. G. Walsh and A. C. Frazer; Emulsions in the Patent Literature, by W. Clayton; The Design of Emulsifying Machines, by R. I. Johnson; Effect of the Mode of Preparation on the Dispersion of Soap-Stabilised Emulsions, by R. Dorey; Problems Connected With the Preparation and Application of Emulsions Used in Agricultural Spraying, by R. M. Woodman; Some Observations on a Typical Food Emulsion, by J. W. Corran; Emulsions and Emulsification in the Wool Textile Industry, by J. B. Speakman and N. H. Chamberlain; The Stability of Emulsions in Thin Films, by L. A. Jordan; Emulsions in the Leather Industry, by W. R. Atkin and F. C. Thompson; Rubber Latex, by H. P. and W. H. Stevens; and Some Physical Properties of Dispersions of Asphaltic Bitumen, by L. G. Gabriel.

The chemistry of the hormones, B. Harrow and C. P. Sherwin (*Baltimore: Williams & Wilkins Co., 1934, pp. VII+227*).—The authors give it as their purpose to produce "a practical book—a book of use to the laboratory worker who wishes to prepare active hormone fractions, or to isolate a chemically pure hormone; and of use to the student who wants a connected account dealing with the chemical characteristics of the hormones, insofar as they

are known at present." The chapter headings are the thyroid hormone, the parathyroid hormone, insulin, the pituitary hormones, the adrenal hormones, the male hormone, the female hormones, secretin, and plant hormones. The book contains also an index of authors and a subject index.

The preparation of a concentrate of vitamins B_1 and B_2 from brewers' yeast, M. I. Smith and A. Seidell (*Pub. Health Rpts.* [U. S.], *51* (*1936*), *No. 22*, *pp. 685–688*).—In continuation of attempts to concentrate and isolate antineuritic vitamin B_1 (E. S. R., 71, p. 208), a method has been developed for the further concentration of both vitamin B_1 and B_2 fractions in the extract derived by eluting the vitamins from the fuller's earth adsorbate. The new concentrates are considered of special value in nutritional investigations requiring rigorous control of the nitrogenous constituents of the synthetic diet, for they contain practically the same amount of nitrogen as in dried brewers' yeast with a vitamin B_1 potency of from 60 to 500 and a B_2 potency of from 70 to 175 times that of dried yeast.

In the method as described the active material was extracted from the fuller's earth adsorbate by suspending the adsorbate in water, adding sodium hydroxide to bring the solution to about 0.4 N, agitating, and acidifying to pH 4.5. The aqueous solution was concentrated by vacuum distillation, the brown precipitate formed containing most of the vitamin B_2 and much of the vitamin B_1. This was further purified by extraction with alkaline methyl alcohol in which the greater part of the inert material was insoluble. In determining the activity of the concentrates for vitamins B_1 and B_2, the tests for B_1 were based on determinations of the minimum amount of concentrate required to bring about a remission in polyneuritic rats. The B_2 activity was measured in terms of weight increment per day when fed for a period of 10 days to rats on a basal diet adequately supplemented with intravenous injections of the crystalline antineuritic vitamin.

The purified preparation contained from 2,000 to 2,500 international units of vitamin B_1 per gram and from 325 to 875 B_2 units per gram, as compared with 6 units of vitamin B_2 contained in 1 g of dried brewers' yeast. In a series of experiments, rats having dermatitis produced by existing on a diet devoid of the vitamin B complex and supplemented with crystalline vitamin B_1 were cured by administration of this preparation.

Precipitation and color reaction for ascorbic acid: Specificity of acidified sodium selenite solution, V. E. Levine (*Soc. Expt. Biol. and Med. Proc.*, *35* (*1936*), *No. 2*, *pp. 231–235*).—Reducing tests are reported for certain compounds of selenium with ascorbic acid and other organic compounds of biological significance which have reducing properties.

Ascorbic acid was found to differ from all of the other substances tested by having the specific property of reducing an acidified sodium selenite reagent in the cold, with the formation of a brick-red color characteristic of free selenium. This color is also imparted in the cold to plant and animal tissues containing ascorbic acid when they are sprinkled with an acidified selenite reagent prepared by adding 1 part of concentrated hydrochloric acid to 5 parts of a 2-percent selenite solution.

The constitution of calciferol (vitamin-D): A review and a suggestion, O. Rosenheim and H. King (*Jour. Soc. Chem. Indus.*, *Chem. and Indus.*, *54* (*1935*), *No. 30*, *pp. 699–701*).—The authors discuss the bases of probability of various proposed formulas, concluding that "the assumption of the presence in calciferol of a tricyclic ring system, embodying a combination of a 10-, 6-, and 5-membered ring, to which is joined a 9-membered side chain, offers such a unique and specific arrangement of carbon atoms that it would not be surprising to find it associated with the equally specific antirachitic activity of

calciferol. The formulas based on this ring system are in agreement with the results of unimolecular surface film measurements and fulfill the demands of X-ray crystallography, a point in their favor without necessarily proving their correctness."

The molecular shape of calciferol and related substances, J. D. Bernal and D. Crowfoot (*Jour. Soc. Chem. Indus., Chem. and Indus., 54 (1935), No. 30, pp. 701, 702*).—The authors compare the formulas suggested in the preceding paper (above noted) from a crystallographic viewpoint. The new suggestions "do not conflict with the X-ray evidence", whereas certain previously proposed formulas do show such a discrepancy.

"The new suggestions plainly call for a much more thorough crystallographic examination of calciferol itself and its related compounds, particularly pyrocalciferol, isopyrocalciferol, and the two dihydrocalciferols. With such complicated compounds the X-ray method does not lead directly to a formula, but once there are definite formulas to choose from it may usefully serve to discriminate between them."

On the mechanism of lysozyme action, K. Meyer, J. W. Palmer, R. Thompson, and D. Khorazo (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 479–486*).—From this study of the lytic action of lysozyme on susceptible bacteria the authors conclude that "lysis cannot be explained on a physical basis: e. g., lowering of surface tension. Lysozyme has no protease, kinase, amylase, lipase, or phosphatase activity. It liberates reducing sugar from mucoids or polysaccharides of the susceptible *Sarcinae* and from a mucoid fraction of egg white. The type of linkage attacked is not known."

Retarding rancidity, W. L. Morgan (*Indus. and Engin. Chem., 27 (1935), No. 11, pp. 1287–1290, figs. 8*).—"Blue and invisible ultraviolet light materially accelerates the development of rancidity in such materials as potato chips, crackers, cakes, butter, candies, nuts, and soaps, whereas other visible light such as red and yellow has little effect. Consequently rancidity-retarding wrappers may be of any visible color except blue. Highly protective yellow transparent cellulose films have been developed and utilized for food packaging."

Second report on the corrosion of the tinplate container by food products, T. N. Morris and J. M. Bryan ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest., Spec. Rpt., 44 (1936), pp. VI+54, figs. 33*).—Extending the findings of a report already noted (E. S. R., 68, p. 296), the authors present their more recent results in five chapters dealing, respectively, with the corrosion of tin, the corrosion of mild steel, the tin-iron couple and tin plate, discoloration of canned fruits, and miscellaneous points of technic.

"It is suggested that in all probability the corrosion of cans by foodstuffs will eventually be overcome by improvements in lacquers and methods of lacquering. Failing such a development, relief must be sought through improvements in the tin coating, improvements in the steel base, the cool storage of canned goods, and the application of knowledge concerning the corrosion of tin plate."

Methods of effecting such improvements are discussed, and experiments that throw further light on the factors affecting the formation of hydrogen swells and perforations and the discoloration of canned fruits are described.

Treating fruits and nuts in atmospheres containing ethylene, E. M. Chace and D. G. Sorber (*Food Indus., 8 (1936), No. 6, pp. 292–294, figs. 4*).—On the basis both of experiments conducted by the U. S. D. A. Bureau of Chemistry and Soils and of their experience with the ethylene treatment, the authors find, with respect to temperature, that the best results have been obtained between 70° and 80° F., the process being slow below 60° and the

results the poorest when the temperature exceeds 90°. The humidity, at least in the case of the citrus fruit treatment, should apparently be about 90 percent. Ethylene concentrations of the order of 1 part to 2 parts per 10,000 have proved effective. Carbon dioxide concentrations of 1 percent have been found to retard the coloring process, and, in the case of oranges, 2 percent has proved harmful. In view of this fact, and the greatly increased respiration observed ("with citrus fruits . . . sometimes as much as 200 percent"), frequent and effective ventilation is thought advisable. A final section on the "nature of the reaction" notes that the reaction "is apparently closely connected with enzyme activity, but whether this is due merely to a change in the permeability of the cell wall or to some catalytic effect on the enzyme is not known. In some ways ethylene acts very much like a plant hormone or auxin. It is now well established that it is a natural constituent of the respiratory gases of fruits in storage and is given off by fruits and vegetables generally when they are injured." It is emphasized that "as far as we have been able to discover, the ethylene treatment brings about no changes which do not occur naturally in the fruits. It merely speeds up natural reactions.

"Whether the reactions taking place naturally are activated by the ethylene normally present in the fruits cannot be said at present. The fact that ethylene is present and apparently takes part in the normal functions of plants, and that no reactions not common to natural ripening have been found, should go a long way in answering criticisms on the use of this gas in coloring."

Apple thinnings as source of pectin, Z. I. Kertesz (*Farm Res. [New York State Sta.], 3 (1937), No. 2, pp. 6, 11, 14*).—"Approximately 1 lb. of concentrated pectin sirup can be obtained from 5 lb. of thinnings. Even when allowance is made for all the expense involved, the cost of the pectin extract from apple thinnings should not exceed one-fourth the cost of commercial pectin extracts on the market. The use of thinnings thus may result in considerable saving, especially where large quantities of jams and jellies are made."

Hot-water extraction and a method of extracting with cold 0.5 percent hydrochloric acid are both described, as is also the concentration of the extract.

Manufacture of champagne and sparkling Burgundy, F. M. Champlin, H. E. Goresline, and D. K. Tressler (*Indus. and Engin. Chem., 27 (1935), No. 11, pp. 1240–1243, figs. 6*).—The authors discuss the essential features of the champagne-making process as carried out with American wines, in a joint contribution from the New York State Experiment Station, the U. S. D. A. Bureau of Chemistry and Soils, and a New York State commercial winery.

Precipitation rate of cream of tartar from wine, G. L. Marsh and M. A. Joslyn (*Indus. and Engin. Chem., 27 (1935), No. 11, pp. 1252–1257, figs. 8*).—Experiments reported from the California Experiment Station show that the precipitation of cream of tartar from new wines is hastened by cold storage, the rate of precipitation depending on the storage temperature and on the type of wine. The rate is more rapid during freezing storage than in cold storage. The actual amount of cream of tartar to be removed from wine for stabilization cannot be predicted from the data available since so many factors determine the actual solubility of cream of tartar in wine.

Pasteurization of New York State wines, C. S. Pederson, H. E. Goresline, and E. A. Beavens (*Indus. and Engin. Chem., 27 (1935), No. 11, pp. 1257–1265, figs. 8*).—The New York State Experiment Station, cooperating with the U. S. D. A. Bureau of Chemistry and Soils, has shown that New York State dry and sweet wines of low alcohol content can be stabilized effectively by pasteurizing at 130° F. for 20 min. and that this pasteurization can be carried out, under suitable control, in bulk, in closed bottles, or in open bottles. "The micro-organisms which occasionally survive the pasteurization at this

temperature are not of the spoilage type and apparently have but little significance."

Experimental malting: Design and operating of laboratory malting equipment, J. A. SHELLENBERGER and C. H. BAILEY (*Brewers Tech. Rev., 11 (1936), No. 1, pp. 3–5, figs. 4*).—The authors describe a relatively small and inexpensive set-up designed at the Minnesota Experiment Station for experimental and testing use in the laboratory. The equipment is electrically operated and provides for steeping, germinating, and drying. The malting procedure, adapted for use with apparatus of this size, is described.

Chemistry of slash-pine (Pinus caribaea, Morelet).—II, Fats, waxes, and resins of the growing tips, J. A. HALL and O. GISVOLD (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 487–490*).—Extending their earlier work (E. S. R., 75, p. 4) on the components of the phloem of the same species, the authors report upon an investigation in which a light petroleum (boiling point from 60° to 70° C.) extract of the young growing tips of *P. caribaea* yielded the following substances: *Paraffins of the C_{8}–C_{9} range, a trace of* α-pinene, melissic acid, melissyl alcohol, *n*-nonacosan-10-ol, a sitosterol and a sitosterolin, palmitic and behenic acids, oily acids apparently consisting of oleic and linoleic acids, and abietic acid.

Lignin in Douglas fir, A. J. BAILEY (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 52–55, figs. 2*).—The author of this contribution from the University of Washington notes that "the middle lamella has been subjected to extensive research, yet our knowledge of its structure and composition is far from complete." By means of a micromanipulator operated under a magnification of 100 diameters he was able to obtain samples of the isolated middle lamella sufficient for analysis by a micromethod. The lignin content of a single sample weighing 0.521 mg was found to be 71.38 percent. "Samples of wood rays, springwood, and summerwood weighing approximately 3 mg gave values of 41.09, 35.24, and 31.56 percent, respectively, all values being based upon the original oven-dry weight of the isolated material."

An electrically heated melting point apparatus, E. DOWZARD and M. J. RUSSO (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 74, 75, figs. 2*).—A Pyrex tube 80 by 180 mm is set concentrically through an asbestos cover into a battery jar and is heated by five turns of thin, narrow Nichrome ribbon serving as an electrical resistance unit. A Pyrex test tube concentrically set through the asbestos cover of the larger Pyrex tube carries the melting point thermometer, another thermometer is set midway between the test tube and the wall of the larger Pyrex tube, and the whole is placed upon a base containing an adjustable "radiostat" and an ammeter in series with the heating element. A drawing and a photograph illustrate the device, for which the necessary constructional directions are given.

The apparatus "is suitable for the determination of melting points up to about 310° C., with a reproducibility of within 0.5°."

A precision pycnometer for liquids, S. T. YUSTER and L. H. REYERSON (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 61, 62, fig. 1*).—In an investigation at the University of Minnesota, in which numerous determinations for the measurement of very slight differences in density were made, "several common types of laboratory pycnometers were tried, but the results were not very satisfactory. The chief faults found were difficulty of thermostating both the liquid and container, evaporation losses at ground-glass joints, loss of liquid during filling (very important in handling expensive liquids), and difficulty of determining the density at some definite temperature."

An apparatus obviating the difficulties named is described and illustrated by a drawing, and its manipulation is detailed.

Self-sealing vessels for storage of solutions used in the Van Slyke gasometric methods, F. E. HOLMES (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 411–415, fig. 1*).—The two types of vessels described were designed to eliminate the glass stopcock in the alkaline stream of the vessel used by Van Slyke, Page, and Kirk (E. S. R., 71, p. 587) and the modified Hempel pipette of Van Slyke and at the same time automatically to provide a mercury seal for the tip of the delivery tube of the simple soda-lime tube of Van Slyke and of its modified forms. "They are especially convenient for those methods in which the solution is passed through a mercury seal in the cup of the Van Slyke pipette and its volume measured in the chamber, for example, for the storing and transferring of 0.5 N NaOH in the carbon combustion method of Van Slyke, Page, and Kirk."

The author describes and illustrates by means of drawings two forms of the apparatus which he has found to give excellent results and a third form which he describes as "a simpler but less satisfactory alternative form" of the first type.

As an illustration of the protection against contamination by carbon dioxide, it is noted that "a strongly alkaline phosphate solution has been stored for nearly 2 yr. without producing any change in the blank in the method in which it is used."

A sensitive check valve, E. L. GREEN (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, p. 40, fig. 1*).—The apparatus described was devised at the U. S. D. A. Bureau of Plant Industry to prevent solutions under treatment with hydrogen sulfide from being drawn back into the gas-purifying train when the gas stream is accidentally interrupted. Water through which the gas must pass is made to float a valve-closing part up against its valve seat, so that a slight but definitely positive gas pressure is necessary to keep the valve open and a zero or negative pressure closes it at once. The parts are two simply blown glass pieces with an outer jacket consisting of a test tube and two-hole stopper. A drawing shows the construction of the device.

A differential refractometer, D. RAU and W. E. ROSEVEARE (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 72, 73, figs. 3*).—The instrument described was designed at the University of Wisconsin "to be a rapid and reliable instrument for determining concentrations of solutions too dilute to permit the use of the Pulfrich or immersion refractometers. It makes use of the bending of a ray of light when passed through a rectangular cell containing a triangular compartment, the former being filled with pure solvent and the latter with solution." As compared with other instruments of somewhat similar optical principle, the new design "is much more practical because of the new method of observing and measuring the deflection and of determining the zero reading."

Official and tentative methods of analysis of the Association of Official Agricultural Chemists, compiled by E. M. BAILEY ET AL. (*Washington, D. C.: Assoc. Off. Agr. Chem., 1935, 4. ed., [rev.], pp. [XIX]+710, figs. 52*).—This is a revised and somewhat enlarged edition of this standard work (E. S. R., 55, p. 11). Important additions include, in the chapter on soils, a method for the determination of selenium and a method for evaluating fertilizers with respect to their acid-forming or nonacid-forming properties; in the chapter on insecticides and fungicides, a method for determining the phenol coefficient; in the chapter on plants, a method for estimating lignin; and, under the head of grain and stock feeds, a vitamin D assay by preventive biological test.

Standard iodine solutions, A. H. SCOTT (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 511–513*).—Using a standard arsenious acid which was repeatedly checked and did not change during the period of its use, the author found that when

0.1 N iodine in 0.12 M potassium iodide is diluted with distilled water and titrated immediately without further addition of potassium iodide there is a loss in equivalence.

A small quantity of iodine was dissolved in water without any potassium iodide. This solution was then used to titrate a dilute solution of arsenious acid (0.0001 N), with starch as the indicator. At the end point potassium iodide was added to make about a 5 percent concentration (0.3 M). The solution then became an intense blue. The additional amount of iodine made available for titration by the addition of the potassium iodide was determined in a second titration with 0.0001 N arsenious acid. The results of such titrations of several dilutions of the original iodine solution showed clearly that a much closer approach to equivalence was secured by adding potassium iodide to the iodine solution in each case in a quantity sufficient to bring the concentration of the salt to 0.3 M. "In addition there must be a final concentration in the titration of 0.3 M KI." Iodine solutions containing potassium iodide in the concentration specified were stable throughout several months. Attention is called, however, to the facts that potassium iodide may contain some free iodine, and that in any case, its solutions liberate free iodine, especially when they are exposed to light. "It is essential, therefore, that the KI solution be made up just before use."

A method of analysis for fluoride, W. M. Hoskins and C. A. Ferris (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 6–9*).—*In a contribution from the California Experiment Station the authors report a study of the estimation of fluoride by titration with standard thorium solution in the presence of sodium alizarin sulfonate as indicator.* "The most favorable procedure includes the use of the indicator at a concentration of 4×10^{-5} percent, in a total volume of 50 cc, titration to match a blank in which the end point is taken at a very light-pink shade, and careful regulation of the pH in both blank and sample, the most favorable pH being 3.5. This latter condition is readily met by the use of the buffer system of sodium hydroxide and chloroacetic acid at a ratio of 0.5 and total concentration of 0.02 M. The dissociation constant of chloroacetic acid in 50 percent commercial alcohol has been found to be 2.8×10^{-4}. Sodium alizarin sulfonate in this alcoholic solution acts as an indicator for H ion over the pH range 4.8 to 7.2 instead of 3.7 to 5.2 as in water. In a volume of 50 cc an average accuracy of 99 percent has been secured with known amounts of fluoride ranging from 57γ to 760γ of fluorine. With 50-cc volumes approximately the same accuracy is possible with 6γ to 90γ of fluorine."

Data indicating the concentrations at which several interfering ions have an effect are given. The most serious of these interferences were those caused by sulfate, arsenate, and phosphate, "which fortunately are left behind when the fluoride is distilled as hydrofluosilicic acid. Sulfuric acid is entirely suitable for the distillation, and a volume of 200 cc distilled at 140° C. accounts for all but a trace of the fluoride. In the ashing of fruit samples containing fluoride for distillation it is very important not to allow the temperature to reach above 600°, for loss is then excessive. Allowance must be made for the fluoride contained in the lime which is added to the sample before ashing. Recovery of fluoride added to apple pulp was 97.3 percent under the most favorable conditions."

A source of loss of ammonia in Kjeldahl distillations, H. S. Miller (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 50, 51*).—The author finds that there is a loss of ammonia by the usual Kjeldahl distillation procedure due to the fact that some ammonia during the first few minutes of distillation is diluted with air to such an extent that part of it escapes absorp-

tion by the standard sulfuric acid through which it passes. The average loss of nitrogen resulting from 47 determinations with ammonium chloride solution was shown to be 1.26 percent, the average deviation being ±1.24 percent.

"*The usual Kjeldahl procedure has been improved by the use of a delivery tube containing holes, each 0.08 mm in diameter, which cause the air bubbles resulting during the first few minutes of distillation to be broken up to such an extent that the average loss of nitrogen resulting from 8 determinations is 0.06 percent, with an average deviation of ±0.12 percent.*"

Copper selenite as a catalyst in the Kjeldahl nitrogen determination, E. J. Schwoegler, B. J. Babler, and L. C. Hurd (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 749–751*).—As the result of an investigation at the University of Wisconsin, copper selenite dihydrate is proposed as a single catalyst in the Kjeldahl digestion of nitrogenous materials. The time required for clearing and for complete digestion was considerably less in the cases studied than that required when other conventional catalysts were used. As an illustration of the differences between the effects of copper selenite and of other catalysts, "duplicate samples of a homogenized corn meal were digested under uniform conditions with 25 ml of H_2SO_4, 12 g of K_2SO_4, and 0.3 g of $CuSeO_3 \cdot 2H_2O$. It was found that with 12 samples weighing between 0.2 and 2 g the average clearing was 13 min., as compared to 23 min. when the same series was digested with 25 ml of H_2SO_4, 10 g of K_2SO_4, 0.7 g of HgO, and 0.3 g of $CuSO_4$ and 17 min. when 25 ml of H_2SO_4, 10 g of K_2SO_4, and 0.1 g of Se were used."

An apparatus for sugar and other titrations, E. S. West (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, p. 62, fig. 1*).—Essential features of this set-up are a vertically oscillating stirrer operated by a windshield wiper mechanism and the use of a stainless-steel hypodermic needle as a burette tip. The note is illustrated by a drawing, and the more important dimensions are specified.

Gravimetric methods for the determination of total body protein and organ protein, T. Addis, L. J. Poo, W. Lew, and D. W. Yuen (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 497–504*).—This general procedure "*is first to prevent autolysis and to render the proteins insoluble by immediate immersion of the carcass and excised organs in a boiling 0.5 M sodium acetate-acetic acid buffer solution kept at pH 5. The material is then reduced to a form in which it can be sampled by methods which vary with the physical character of each organ or part.* Water-soluble substances are washed out with acetate buffer, fats, and acetate with hot alcohol, and finally water is removed by drying in vacuo. The remainder is weighed. Nonprotein material which cannot be removed, such as minerals derived from bone, and glycogen that cannot completely be washed out from the liver, are determined and subtracted. The material thus measured is regarded as giving the nearest approximation to the amount of the protein structure required for the manifestation of vital phenomena, the essential machinery stripped of storage material and accessories and separated from the medium within which it operates."

An improvement on the Swift fat stability apparatus for approximating the end of induction period, V. C. Stebnitz and H. H. Sommer (*Oil & Soap, 12 (1935), No. 9, pp. 201, 202, fig. 1*).—At the Wisconsin Experiment Station the authors substitute a test based upon the development of volatile acidity for the odor test as an indicator of the end of the induction period. The exhaust from the tubes in which the fat is aerated is passed into test tubes containing 1 cc each of 0.01 N sodium hydroxide diluted in water sufficient to cover the ends of the delivery tubes, and to this solution is added about 2 drops per tube of methyl red indicator solution. The change from yellow to pink is taken as the end point.

Determination of reduced ascorbic acid in blood, M. Pijoan, S. R. Townsend and A. Wilson (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 224–226, fig. 1*).—Discrepancies in the results obtained in duplicate and triplicate readings on the same sample of plasma in the determination of the reduced ascorbic acid in the blood by the method of Farmer and Abt (E. S. R., 75, p. 588) led to an investigation of the stability of the ascorbic acid in the blood plasma on standing. In this preliminary report data are given showing that the ascorbic acid value of the blood is materially affected by standing either in the ice box or at room temperature. It is stated that determinations should be carried out within ½ hr. after the collection of the blood.

Determination of formic acid in pyroligneous liquors, H. D. Weihe and P. B. Jacobs (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 44–47, figs. 3*).—A method for the convenient determination of formic acid in pyroligneous acid, based upon the removal of certain volatile and nonvolatile interfering substances, followed by the oxidation of the formic acid to carbon dioxide in a closed system using mercuric acetate as oxidizing agent, is presented in a contribution from the U. S. D. A. Bureau of Chemistry and Soils.

AGRICULTURAL METEOROLOGY

Handbook of climatology, I (B–C), edited by W. Köppen and R. Geiger (*Handbuch der Klimatologie. Berlin: Borntraeger Bros., 1936, vol. 1, pt. B–C, pp. VIII+[2]+XII+B1–B556, figs. 96; pp. C1–C44, figs. 14;+pp. 12*).—This part of a projected 5-volume handbook of climatology deals with Climatological Elements and Their Dependence on Terrestrial Influences, by V. Conrad; and the Geographic System of Climates, by Köppen; and gives title, preface, contents, and alphabetical index of volume 1. Parts of the handbook previously issued have been noted (E. S. R., 65, p. 413; 67, pp. 211, 654; 68, pp. 156, 157; 72, p. 446).

Relations between solar and terrestrial phenomena (*Relations entre les phénomènes solaires et terrestres. Firenze (Florence): Cons. Internatl. Unions Sci., 1936, pp. 159, figs. [17]; rev. in Nature [London], 138 (1936), No. 3488, p. 397*).—This is the fourth report of the Commission for the Study of Solar and Terrestrial Relationships, set up in 1924 by the International Council of Scientific Unions. In addition to an introductory chapter by G. Abetti giving a general survey of the subject for the past three years, brief articles are included on solar radiation and phenomena, magnetic conditions of the earth, polar auroras, propagation of radioelectric waves, absorption in the upper atmosphere of the earth, cosmic rays, light of the night sky, and meteorological and climatological variations on the earth.

The influence of forests on climate and water supply in Kenya, [I], II, III, J. W. Nicholson (*East African Agr. Jour., 2 (1936), Nos. 1, pp. 48–53; 2, pp. 164–170; 3, pp. 226–240*).—Reviewing the available information regarding influence of forests on temperature, rainfall, run-off, stream flow, evaporation, and other factors, with special reference to Kenya, the author concludes that "some forests may be of very local climatic influence; the majority exercise a regional influence on climate." These latter must be recognized as a national asset, especially as regards equalization of rainfall, stream flow, run-off, and winds.

Comparative measurement of temperature in the zone of plant climate [trans. title], E. Tamm (*Landw. Jahrb., 83 (1936), No. 4, pp. 457–554, pl. 1, figs. [53]*).—Observations on air and soil temperatures at 5 and 30 cm above and below the soil in winter rye, winter wheat, oats, summer barley, and potatoes, as compared with temperatures in the open, showed as distinct difference of temperature conditions in crops like cereals harvested in the first half of the

summer as in those of lower growth like potatoes harvested later. Temperatures of air and soil were higher in the cereals, reaching their maximum in July, than in potatoes, which grew throughout the season.

The set-up and procedure used in the observations and the interpretation of the data are explained in detail.

Weather in cycles, B. HIBBS (*Country Gent., 107 (1937), No. 2, pp. 7, 8, 79–82, figs. 3*).—This is a popular exposition of C. G. Abbot's views regarding influence of variations in solar radiation and sunspot cycles on terrestrial weather.

Climatic index of crop risks [trans. title], KRISCHE (*Ernähr. Pflanze, 32 (1936), No. 15–16, p. 268; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 6, p. 896*).—An index obtained by dividing the highest yields of various crops in different parts of Germany by the lowest yields during a period of 10 years is briefly explained and discussed.

The influence of rainfall on the yield of a natural pasture, H. C. TRUMBLE and E. A. CORNISH (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 1, pp. 19–28, figs. 3; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 6, p. 894*).—In a study of the influence of amount and distribution of rainfall on natural pasture, consisting predominantly of *Danthonia*, with smaller quantities of exotic annuals such as *Festuca myuros*, *Trifolium arvense*, *T. procumbens*, *Erodium botrys*, and *Echium plantagineum*, top-dressed with superphosphate and grazed by sheep, "high significant positive correlations were obtained between the yield of each pasture and the rainfall for January–December, January–June, the trimonthly and bimonthly periods between February and July, and the single month of April. The correlation was strongest in the period April to June, inclusive, which coincides with the early stages of seasonal growth. High significant negative correlations were found between the yield of each pasture and November rainfall. There was, however, a significant negative relationship, for the 10 years in question, between April–June rainfall and November rainfall. Elimination of this effect by partial correlation reduced the association between November rainfall and yield to insignificance. The effectiveness of autumnal and early winter rainfall and the relative ineffectiveness of late winter and spring rainfall in determining yield appear to be associated with the type of pasture investigated, which is composed of species with a restricted growing period and a limited capacity for production. The replacement of these species by cultivated herbage plants with a perennial deep-rooted habit and a capacity for growth over all or most of the year enables the rainfall to be used more effectively, and constitutes an important application of the results in practice."

Smudging for frost protection [trans. title], A. HOVD (*Meld. Norske Myrselskaps Forsøksstа. Maeresmyra, 24–25 (1931–32), pp. 36–46, figs. 4; abs. in Bioklim. Beibl. Met. Ztschr., 3 (1936), No. 3, p. 141; Ann. Agron. [Paris], n. ser., 6 (1936), No. 6, p. 891*).—This article reports successful use of smudges produced by pine woods litter, sphagnum moss, and peat briquettes as protection against frost, and advises application of fertilizers, especially potash, to hasten maturity.

SOILS—FERTILIZERS

Soils: Their origin, constitution, and classification, G. W. ROBINSON (*New York: D. Van Nostrand Co., 1936, 2. ed., rev., pp. XVII+442, pls. 5, figs. 17*).—This is a revised edition of a work (E. S. R., 68, p. 733) the basic outline of which has been altered only in the omission of an appendix on soil analysis. "I have only included such new work as has modified my earlier views and have by no means attempted to record everything that has been written on soils in the intervening years. . . . The facts which have come to my

notice have fallen into a certain perspective and have produced my picture of the soil. Another pedologist might arrange the same facts in a different perspective and produce another picture."

The study of the soil in the field, G. R. Clarke (*Oxford: Univ. Oxford, Imp. Forestry Inst., 1936, pp. 142, figs. 7*).—This book is mainly a discussion of various soil surveying systems in present use, the treatment being that of a guide for the field worker. Following a preface by C. G. T. Morison, the book contains chapters on soil site characteristics, the soil-profile pit, soil-sample collection (monolith collection), mapping of soils, and notes on various soil-survey systems, including those of Bayern (Bavaria), Hungary, Russia (landscape), Macaulay Institute for Soil Research, America (series), English soil series survey, and English regional survey. A condensed index concludes the volume.

[Soil investigations of the California Station] (*California Sta. [Bien.] Rpt. 1935–36, pp. 11–15, 20*).—The topics upon which brief reports are here made include permeability of soils, effect of puddling on permeability, effect of irrigation and cropping on soil temperatures, soil temperatures at various depths, soil colloids, basaltic lava soils, potassium in California soils, and soil deficiencies (zinc).

[Soil work, Hawaii Station], O. C. Magistad et al. (*Hawaii Sta. Rpt. 1936, pp. 42–44*).—This work has included correlation of results of field experiments with laboratory and greenhouse tests, moisture surface force curves, and oxidation-reduction potential.

A handbook on Hawaiian soils, W. W. G. Moir et al. (*Honolulu: Assoc. Hawaii. Sugar Technol., 1935, pp. VI+266, figs. [44]*).—"For some time there has been a need for a reference book on the various phases of soil science and their relation to Hawaiian soils in particular. . . . The information has been available, but scattered through so many publications that it has been next to impossible for those interested in the agricultural industries of these islands to be able to refer to these publications. . . . As a mutual aid to each other in their respective fields of work and as an aid to those seeking the basic information, a committee of those responsible for much of the soil research in Hawaii has rather hurriedly compiled a series of lectures on these subjects. . . . It has been the desire of the committee to keep the subject matter somewhat elementary so as to meet the desires of many men in the industries who have not been as fortunate as others in securing an education along these lines. There is, however, sufficient data and enough advanced discussion presented to make them of value to anyone."

The contents are as follows: Soil making processes, by H. S. Palmer; chemical aspects, by W. W. G. Moir et al.; physical aspects, by H. A. Wadsworth; microbiological aspects, by O. N. Allen; soil management, by N. King et al.; and soil survey methods of classification and study, by L. R. Smith.

Nevada soils: An outline of proposed investigations, V. E. Spencer (*Nevada Sta. Bul. 144 (1936), pp. 17, figs. 4*).—The author points out the relative increase in the importance of agriculture as one of the major industries of the State, calls attention to an already evident depletion of the native fertility of the soils long in use, and emphasizes the importance of the completion of the State soil survey, the necessity for establishing field experiments, and the value of laboratory and greenhouse investivations, soil testing, a State fertilizer law, and laboratory fertilizer control work.

[Soil researches of the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 74, 76*).—The report contains brief notes on the influence of fertilizers on the loss of microscopic organisms from soils, by J. K. Wilson; and nitrogen balance in soil under different cropping systems, by T. L. Lyon and J. A. Bizzell.

Some animal relations to soils, W. P. TAYLOR (*Ecology, 16 (1935), No. 2, pp. 127–136*).—This contribution from the U. S. D. A. Bureau of Biological Survey discusses the following among other ways in which animals influence the development and stability of soils: Accumulating animal bodies or parts; accumulating materials for houses, shelters and nests, and storage of food material; soils packing; dam building and flooding; digging of burrows and associated soils working; promoting erosion; and preventing erosion.

***Neutralization curves of the colloids of soils representative of the great* soil groups,** M. S. ANDERSON and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 542 (1936), pp. 39, figs. 13*).—From a study of the chemical composition of extracted colloids of the profiles of various major soil groups, their exchangeable bases, their titration curves, and the titration curves of such sparingly soluble substances as tungstic acid, mucic acid, ferric hydroxide, aluminum hydroxide, and silicic acid, the authors have obtained data upon which they base the following, among other conclusions:

"The pH values of electrodialyzed colloids vary with the chemical composition of the colloids. Those with high silica: sesquioxide ratios tend to have lower pH values (2.5 to 3.0), while the pH range of colloids of low ratio is usually from 3.5 to 4.5. The character of neutralization curves made with sodium hydroxide varies widely for colloids of the different soil groups. The colloids of Pedocal soils show the strongest acid character. About 0.55 milliequivalent of sodium hydroxide per gram of colloid is required to produce a pH value of 7. There is considerable evidence of a break in the curve for these colloids between pH 6 and 8. . . . The colloids of the lateritic soils have much weaker acid qualities than those of the Chernozem soils, and their titration curves are of such markedly different form that the two groups are readily differentiated by this means. The Prairie group and the Gray-Brown Podzolic group have titration curves intermediate in character between those of the Pedocal and the lateritic soils. The curves for the colloids of true Podzols are widely different for adjacent horizons of a particular profile, and corresponding horizons of different profiles show wide variation in acidic qualities as well as in chemical composition.

"The acid character of the colloidal organic matter is in most cases so pronounced that when such organic matter is present in considerable quantity it tends to obscure the behavior of the inorganic portion. The acid qualities of the bentonite colloids are distinctly stronger than those of the inorganic soil colloids but weaker than humic acid extracted from the soil. The acid character, brought out by titration data, is related in a general way to the fertility of a soil."

Lysimeter experiments.—IV, Records for tanks 17 to 20 during the years 1922 to 1933, and for tanks 13 to 16 during the years 1913 to 1928, T. L. LYON and J. A. BIZZELL (*[New York] Cornell Sta. Mem. 194 (1936), pp. 59*).—The conclusions recorded in the present memoir, which extends a series earlier noted (E. S. R., 64, p. 520), were drawn from experiments on 4-ft. depths of Petoskey gritty sandy loam, placed in the lysimeter tanks in 1921; on Volusia silt loam tanks under experimental treatment since 1910; and from a comparison of the results with those of the experiments on Dunkirk silty clay loam, set forth in Memoir 12 (E. S. R., 39, p. 517).

"With every soil, the nitrogen contained in the drainage water was practically all in the form of nitrates, there being only traces of organic, nitrous, or ammonic nitrogen present. In all three soils there was a marked decrease of nitrogen in the drainage water from the planted soil as compared with the

soil on which no plants were grown. . . . The amount of nitrogen in the crops and in the drainage water combined was greater from the limed than from the unlimed Volusia soil, but this was not the case with the other two soils. . . .

"Calcium was the cation removed in largest amount in the drainage water from each of the three soils. The Dunkirk soil lost the largest amount of calcium, the Volusia lost less, and the Petoskey lost the least. The removal of calcium was larger in every case from the unplanted than from the planted soil. . . . There was a conservation of calcium effected by cropping, even when the entire above-ground parts of the plants were removed. . . . Only on the Volusia soil [on which plant growth responded most favorably to liming] did liming increase the amount of calcium removed in the drainage water. This effect was considerable. . . .

"In no soil did the magnesium removed in the drainage water approach in amount the calcium so removed. In all three soils, the percentage of magnesium was higher than that of calcium, except in the fourth foot of the Dunkirk. Like calcium, magnesium was present in greater amount in the drainage water from the unplanted soil than in crops and drainage water combined on the soils that were planted. The effect of liming on the loss of magnesium in the drainage water was not perceptible in the case of the Petoskey soil. The limed Dunkirk yielded somewhat more magnesium in the drainage water than did the unlimed, but the Volusia released 33 percent more magnesium in the drainage from the limed than from the unlimed soil.

"All the soils lost more potassium than magnesium in the drainage water, but less potassium than calcium. As between the three soils there was no great difference in the amount of potassium removed, especially as between the Dunkirk and the Petoskey, but the removal from the Volusia was somewhat less. The crops grown on the Dunkirk soil contained more potassium than did the drainage water from the same tanks. The reverse was true of the other two soils. This may possibly be accounted for by the better growth of plants on the Dunkirk soil. Potassium was not conserved by the growth of plants on the soil, as were calcium and magnesium. Potassium appears to be less influenced by the nitrate ion. In general, the results from liming did not indicate that the solubility of potassium was increased thereby.

"The amounts of sulfur in the drainage water from the Petoskey and the Dunkirk soils were about equal for the corresponding soil treatments. The Volusia soil yielded somewhat less sulfur in the percolate. The amount of sulfur in the crops was least for the Petoskey soil, was somewhat greater for the Volusia, and was greatest for the Dunkirk soil. In all cases there was much more sulfur in the drainage water than in the crops. When the sulfur in the crops was added to that in the drainage water, the removal from the planted and from the unplanted soil was not greatly different, especially in the Dunkirk and Petoskey soils. The large surplus of sulfur in the drainage water probably accounts for the failure of plant growth to respond to applications of sulfur to these soils. While there was slightly more sulfur in the drainage water from the limed than from the unlimed soil in all three of the soil types, the differences were so small that they are of doubtful significance. Differences in the amounts of sulfur in the crops were also slight and were not uniform. . . .

"Only traces of phosphorus were found in the drainage water from any of the three soils. The only data on phosphorus removal are therefore confined to the phosphorus contained in the plants. As the yields of crops were larger on the Dunkirk soil than on the other two types, the total quantity contained in the crop was larger. The percentage of phosphorus in the crops

from the Dunkirk and from the Volusia soil was about the same. That in the Petoskey soil was somewhat higher. With all three soils, the percentage of phosphorus was slightly greater in the crops grown on the limed tanks than in those on the unlimed tanks."

Appendix A outlines the methods of analysis used, and appendix B contains 12 additional tables of data concerning flow of drainage water and related matters.

Base exchange in soil separates and soil fractions (sand and silt), A. T. PERKINS and H. H. KING (*Soil Sci., 42 (1936), No. 5, pp. 323–326*).—In an investigation carried out at the Kansas Experiment Station, the authors treated Wabash, Summitt, Derby, and Cherokee soils with hydrogen peroxide to destroy all organic matter and fractionated the mineral components of the soils by a sedimentation method into separates having sedimentation periods of (1) 6⅔ min., to deposit from 2 ft. of water, (2) between 6⅔ and 40 min., (3) between 40 min. and 4 hr., (4) between 4 and 24 hr., (5) between 24 hr. and 6 days, and (6) material remaining in suspension for more than 6 days. The first four separates were further fractionated, by means of mixtures of carbon tetrachloride and bromoform, into fractions having the specific gravities 2, 2.4, and 2.6. No satisfactory means for fractionating the two finest sedimentation separates into specific gravity fractions was available.

Measurements of the base-exchange capacity of these separates and their fractions on the two bases of milliequivalents per 100 g and of milliequivalents per 10^{-5} cm^2 of estimated particular surface showed that "as particle size in soil separates decreases, base-exchange capacity increases per unit weight but decreases per [unit of] surface area. As particle size in soil fractions decreases, base-exchange capacity of the 2–2.4 fraction remains constant but that of the 2.4–2.6 and 2.6–+ fractions increases per unit weight. All soil fractions as they become finer exhibit smaller base-exchange capacity per unit surface area."

Peat land as a conserver of rainfall and water supplies, A. P. DACHNOWSKI-STOKES (*Ecology, 16 (1935), No. 2, pp. 173–177*).—The author points out, in a contribution from the U. S. D. A. Bureau of Chemistry and Soils, that "in considering the direct value of peat land to water supplies and the need of conserving precipitation, American peat deposits may be placed into three major zonal groups and further subdivided into minor groups representing more or less definite combinations of physical features, land relief, drainage, and vegetation. . . . The three major zonal groups are (1) the northern group of peat land with an abundance of moisture, (2) the central continental group with a fluctuating and unstable moisture supply, and (3) the group of southern and western peat land with insufficient moisture or a periodic water supply. The problem of water conservation in each of these major groups is naturally different. In a general program of utilizing peat areas as water resources and obviating harmful effects, the plan should include a general reconnaissance of watershed provinces and the correlated factors that limit the use of peat areas in a constructive scheme of water economy or for other national objectives. Retiring large tracts of submarginal peat land offers an opportunity for conserving safeguards against drought, floods, erosion, and lowered ground waters and for restoring the activity of natural vegetation as a contsructive factor in the nation's land and water problems."

How to build up and maintain the virgin fertility of our soils, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 42 (1936), pp. 10*).—This is a popular discussion of elementary principles of tillage and fertilizer practice.

The decomposition of organic matter in relation to soil fertility in arid and semi-arid regions, P. C. J. OBERHOLZER (*Soil Sci., 42 (1936), No. 5, pp. 359–379, figs. 9*).—Experiments carried out at the University of Arizona indicated that the decomposition of added organic matter was without appreciable effect upon the pH value of calcareous soils.

The solubility of the soil phosphates was practically unaffected by decomposing organic matter, and the effect upon the content of nitrates and other soluble salts appeared to depend mainly upon the chemical nature, and especially the carbon: nitrogen ratio, of the added material. "Percolation studies led to the conclusion that during the first few weeks active decomposition results in large increases of soluble salts, especially calcium bicarbonate. After 6 weeks had elapsed, however, the difference between treated and untreated soils was negligible.

"Alfalfa, hegari, and manure decompose in the order mentioned when CO_2 production from soils is taken as an index to rates of decomposition. Larger amounts of CO_2 are produced than are reported for humid regions, and maximum production always occurs during the first or second day. Glucose, lignin, cellulose, and starch undergo decomposition in the order mentioned when incorporated with a soil and when rates of decomposition are estimated by CO_2 evolution. . . .

"The rate at which organic matter decomposes increases with increasing moisture up to almost complete saturation. However, considerable losses occur even below the wilting coefficient. . . .

"Decomposition of organic matter increases with temperature, the maximum being around 45° C. as found by CO_2 production from soils. Although microorganisms are sensitive to low temperatures, adaptations are possible, allowing them to function over a relatively wide range of temperature conditions. . . . It appears that temperature is a more important factor than moisture in the decomposition of organic matter, but obviously a combination of the two is the actual criterion. . . .

"Neubauer investigations showed that actively decomposing organic matter is injurious to the growth of seedlings. It further appears that organic matter affects the availability of phosphates only to the extent of its own content of phosphate, but markedly increases the availability of potassium from the soil."

The influence of organic matter on nitrate accumulation and the base exchange capacity of Dickinson fine sandy loam, H. C. MILLAR, F. B. SMITH, and P. E. BROWN (*Jour. Amer. Soc. Agron., 28 (1936), No. 10, pp. 856–866, figs. 7*).—The authors report from the Iowa Experiment Station an investigation involving experiments designed to show the effect of decomposing wheat straw, oat straw, Sudan grass, sorgo, flax, cornstalks, millet, hemp, soybeans, sweetclover, red clover, and alfalfa on the accumulation of nitrates in the soil, the base-exchange capacity of the soil, and the carbon and humus contents of the soil.

"The accumulation of nitrates in the soil was significantly correlated with the nitrogen content of the material added. The materials having a relatively wide carbon: nitrogen ratio depressed nitrate accumulation in the soil to a greater extent than the materials having a relatively narrow carbon: nitrogen ratio.

"The exchange capacity of Dickinson fine sandy loam was increased materially by the decomposing plant materials in one experiment, and there was no consistent difference in the exchange capacity of the soils treated with the different plant materials as decomposition proceeded in another experiment. The first experiment was carried out under laboratory conditions and at about

25° C., whereas the second experiment was carried out under greenhouse conditions, beginning in July. The air temperature in the greenhouse was frequently above 110° F. The high temperature and the resultant increased decomposition of the materials undoubtedly explain the differences in the effect of the materials on the exchange capacity of the soil. In general, the leguminous materials increased the exchange capacity of the soil more than the nonleguminous materials."

The value of summer cover crops, R. M. BARNETTE (*Citrus Indus., 17 (1936), No. 7, pp. 5, 20*).—A popular discussion from the Florida Experiment Station points out the generally accepted values of cover crops and the reasons for giving preference, when and where it is practicable to do so, to a leguminous cover crop.

Problems in soil microbiology, D. W. CUTLER and L. M. CRUMP (*London and New York: Longmans, Green & Co., 1935, pp. VII+104, pl. 1, figs. 18*).—This book condenses the substance of a series of lectures, and "the theme throughout is to show that from the biologist's viewpoint the soil is an eminently suitable home for living organisms and that, through the long ages of evolution, a population has been selected which is on the whole so unspecialized that almost any substance which finds its way into the soil, either naturally or in the course of modern agricultural practice, will eventually become incorporated into the general soil economy. The activities of each micro-organism depend upon those of its fellows, and the threads of all their lives together form a skein which is still inextricably tangled. The whole problem can only be attacked by tracing the threads one by one, and the results of some of these attempts at disentangling the threads are given in this book."

The contents are: The suitability of the soil for micro-organisms, the bacterial population under field conditions, the relation of bacteria to nitrite, carbon dioxide production by soil, the growth of protozoa in pure culture, the behavior of protozoa in soil, the interactions between the soil organisms, a list of literature cited, an index, and a map showing protozoan distribution.

Adsorption of bacteria by soils, T. C. PEELE ([*New York*] *Cornell Sta. Mem. 197 (1936), pp. 18, pls. 2, figs. 3*).—The data here presented show that when two widely differing New York soils—Volusia silt loam and Ontario loam—are placed in contact with a suspension of negatively charged bacteria, the bacterial cells are to a large extent removed from suspension and become attached to the soil particles. The attraction of soil for bacteria was found to be markedly influenced by the base predominating in the soil-exchange complex, and it appeared probable that this is the factor which determines whether or not a given soil will absorb a given species of bacteria. The soils saturated with ferric or aluminum ions adsorbed *Azotobacter chroococcum* the most strongly, and the soils saturated with Li^+, Na^+, K^+, or NH_4^+ adsorbed these bacteria the least strongly. Soils leached first with lithium-, sodium-, potassium-, or ammoninm-chloride solutions and then with distilled water showed much larger numbers of bacteria passing out in the leachate than did soils leached with water alone. Soils leached with iron- and aluminum-trichloride solutions showed fewer organisms passing through in the leachate than did soils leached with water alone.

Experiments on adsorption of electronegative and electropositive dyes by soils showed a close analogy between the adsorption of electronegative dyes and negatively charged bacteria; that is, the soils which adsorbed the electronegative dyes the most strongly and the electropositive dyes the least strongly were the ones which adsorbed the negatively charged bacteria the most strongly.

Carbon dioxide determinations indicate that adsorption of bacteria very markedly decreases their biochemical activity as measured by the effect on CO_2

evolution. There was a close correlation between the percentage adsorption of the bacteria and the extent to which the soil retarded the evolution of CO_2.

Bacillus mycoides and *Rhizobium meliloti*, as well as *A. chroococcum*, were found to be strongly adsorbed by Volusia silt loam.

"The evidence presented indicates that the adsorption of bacteria by soils is due to the attraction of unlike electrical charges. This offers an explanation also of the strong adsorptive power of iron and aluminum hydrogels toward negatively charged bacteria, the iron and the aluminum being electropositive in acid solution."

Physiological studies on Rhizobium species, D. G. CLARK (*[New York] Cornell Sta. Mem. 196 (1936), pp. 30*).—"In attempting to demonstrate the nitrogen-fixing ability of the root-nodule organism, mass cultures of several *Rhizobium* species containing approximately one billion bacteria per cubic centimeter from young transfers were maintained in modified Ashby's solution under a variety of environmental conditions. Sugar concentration, pressure of atmospheric nitrogen, light intensity, presence of a growth accessory, and association of rhizobia with other organisms (including *Bacillus subtilis*, *Chlorella* sp., and *Azotobacter chroococcum*), were among the variables introduced. Analysis of the cultures showed no significant increases in nitrogen content over that of the controls.

"Results of another experiment, which involved a delicate biological test for fixation, showed that *Chlorella* was unable to grow in a solution free of combined nitrogen inoculated with *Rhizobium*, whereas *Azotobacter* under similar conditions produced excellent growth of the alga.

"It appears that *Rhizobium* is unable to fix atmospheric nitrogen apart from the host, at least under the experimental conditions provided."

The substance responsible for growth acceleration of *R. trifolii* is shown to be soluble in chloroform, carbon tetrachloride, and alcohol and slightly soluble in acetone; insoluble in ethyl ether and petroleum ether; present in brown sugar and "calcium saccharate" and detectable in peptone; absent from cornstarch; destroyed by ashing and wet combustion; dialyzable to about the same degree as are the soluble nitrogen and the ash present in carrot extract; a nonelectrolyte; strongly adsorbed by charcoal; soluble in the presence of lead acetate; and nonvitaminlike in character, not readily oxidized, and nonvolatile.

"By reason of the foregoing facts it may be asserted that the substance in question is an organic complex of relatively low molecular weight, and is probably not one of the specific substances called 'rhizopin', 'auxin', or 'inositol', the active substance from *Rhizopus* having different solubility characteristics, the auxins being easily oxidized and inosite being precipitated by basic lead acetate."

Influence of rotation and manure on the nitrogen, phosphorus, and carbon of the soil, J. E. GREAVES and C. T. HIRST (*Utah Sta. Bul. 274 (1936), pp. 15*).—The authors report the effects of an experiment with the rotation oats, beets, beets, oats, and 3 years' alfalfa on the nitrogen, phosphorus, and organic material of an irrigated silt loam. It was found that oats remove more nitrogen than do sugar beets when the crowns are returned to the soil, but when the crowns are also removed the two crops deplete the soil of its nitrogen to the same extent. Properly inoculated alfalfa feeds first on the combined nitrogen of the soil and only when this is insufficient does it draw on the nitrogen of the air. "Hence, rotations in which the alfalfa is removed from the soil do not maintain the nitrogen of this soil. However, there are two practical methods of maintaining the nitrogen of the soil: (1) Planning systems of crop rotations with legumes, the legume being plowed under and allowed to

decay, thus furnishing nitrogen to the succeeding crop; and (2) practicing a combined system of crop rotation and livestock farming, the legume being fed and the manure returned to the soil.

"The rotation investigated in this work showed a loss of 83 lb. of nitrogen from each acre to a depth of 3 ft. Thirty-nine lb. of this was removed by the beets and oats. The balance was either removed by the alfalfa or leached below the third-foot level by the water. Alfalfa removes twice as much phosphorus from the soil as do either oats or sugar beets. During the life of this experiment (18 yr.) analysis showed a loss of 720 lb. of phosphorus from each acre of soil, only 491 of which was removed by the crops, the balance being held in the undecomposed plant residues carried below the third-foot level by irrigation water. The rotation under consideration increased the carbon of the soil and widened the carbon : nitrogen ratio, thus rendering the soil more productive."

Oxygen and carbon dioxide content of culture solutions in relation to cation and anion nitrogen absorption by tomato plants, L. B. Arrington and J. W. Shive (*Soil Sci., 42 (1936), No. 5, pp. 341–357, pl. 1*).—The authors report from the New Jersey Experiment Stations an investigation in which oxygen and carbon dioxide were determined in aerated and nonaerated culture solutions, and the cation and anion absorption ratios were determined after the roots of the plants had been immersed in the solutions during 6-hr. test intervals.

"The aerated culture solutions invariably showed a higher oxygen tension than did the corresponding nonaerated solutions at both pH levels. H-ion concentration, as such, had no apparent influence upon the oxygen tension of the solutions. Aeration produced a marked increase in the rates of absorption of cation, anion, and total nitrogen from the culture solutions over the corresponding rates from the nonaerated solutions at both pH levels. The rates of absorption of cation nitrogen from the solutions at pH 7.0 were higher than the corresponding rates at pH 4.0. Conversely, the rates of absorption of anion nitrogen from the solutions at pH 7.0 were lower than the corresponding rates at pH 4.0. Yields produced by the aerated cultures were approximately double the yields produced by the corresponding nonaerated cultures. Rates of total nitrogen absorption (cation plus anion nitrogen) were slightly but consistently higher from solutions at pH 7.0 than from the corresponding solutions at pH 4.0. Growth yields produced by the cultures at pH 7.0 were invariably higher than those produced by the corresponding cultures at pH 4.0, and these paralleled the absorption rates of total nitrogen. Yields of plant material produced by the aerated cultures were approximately double the yields produced by the corresponding nonaerated cultures. Accumulation of carbon dioxide occurred in all solutions in contact with plant roots. Accumulation at pH 7.0 greatly exceeded that at pH 4.0. As the result of the sweeping action of the aerating process, accumulation in the nonaerated solutions invariably exceeded that in the corresponding aerated cultures.

"Carbon dioxide accumulation in the culture solutions appeared to be without effect upon growth, nitrogen absorption rates, or oxygen content of the solutions."

Summer citrus fertilization, R. W. Ruprecht (*Citrus Indus., 17 (1936), No. 7, p. 10*).—Recommendations specifically adapted to the conditions of the current season are given in a brief note from the Florida Experiment Station.

A study of the basicity of dolomite, rock phosphate, and other materials in preparing non-acid-forming fertilizers, H. L. Cook and S. D. Conner (*Jour. Amer. Soc. Agron., 28 (1936), No. 10, pp. 843–855, figs. 9*).—In the

experiments here reported from the Indiana Experiment Station, it was thought that by using a procedure similar to that of the Neubauer test effects could be obtained more rapidly than by ordinary pot cultures. "A thickly planted crop was grown, then removed, and the soil thoroughly leached to imitate the effect of rainfall which might occur during several months in the field. New fertilizer was added, another crop grown, removed, and the soil leached. After five such treatments, one crop was grown without aditional fertilization to get the residual effect. Then the soil was removed and mixed. . . . The following analyses were then made on soils from each treatment: The Jones acidity, Hopkins acidity, percentage saturation, and the pH in water and normal potassium chloride. Aliquots of the five leachings were taken, mixed, and analyzed for phosphorus, calcium, and magnesium." The soils used were a Miami and a Norfolk sandy loam. With the single exception of the Hopkins acidity value as determined for the Miami soil, "there is a significant similarity in the trend of results between various treatments on both soils." In the order of decreasing effectiveness for neutralizing acidity, the materials used were calcium silicate, fine dolomite, calcium carbonate, and tricalcium phosphate.

"There was in all cases better nitrification with the fine dolomite, the calcium carbonate, the tricalcium phosphate, and the calcium silicates than with the fertilizer alone or fertilizer neutralized with raw phosphate."

Acidulated fertilizers for alkaline soils, W. T. McGeorge (*Calif. Citrogr.*, *21 (1936), No. 10, pp. 368, 384*).—A note from the Arizona Experiment Station points out that such long-lived crops as fruit trees may be irremediably injured by the time they show any evidence of the harmful effects of an alkaline condition of the soil, and that "it appears logical to assume that if a fertilizer fortified with an acidulated organic base or 50 to 200 lb. sulfur per ton of fertilizer is used continuously for alkaline or calcareous soils, beginning at the time of planting, fruit trees should be able to obtain a normally balanced nutrient absorption from the soil at all times and not be continuously subjected to the stress of high soil pH." The author considers that the residual acidity of ordinary fertilizers is not likely to be sufficient to meet the needs of alkaline or calcareous soils. The advantages of residually acid fertilizers for such soils "would probably be more strongly manifested on fruit trees where the stress of alkalinity is continuous than in grains, truck crops, and other annual crops where the period of stress is short and nonaccumulative. Acidulated tankage or other acidulated organic material and sulfur are suggested as the most suitable acid fillers for acidified fertilizers. Where crops are subject to chlorosis such a fertilizer should be profitable, and it has the additional advantage that small amounts of zinc or iron salt, which are often deficient in such soils, could be added and as organic salts would be very available to the crop."

The effect of sulfur and sulfuric acid upon the development of soil acidity at different depths, G. S. Fraps and J. F. Fudge (*Jour. Amer. Soc. Agron.*, *28 (1936), No. 12, pp. 1012–1016*).—At the Texas Experiment Station various quantities of sulfuric acid and sulfur were added to the surface 5 in. of a Lufkin fine sandy loam in 18-in. tiles, and the pH values of samples of the soils from different depths were determined at intervals over a 5-yr. period.

"Maximum acidity of the surface soil developed within 10 weeks, and that of the next 2 or 3 in. within 4 mo. after treatment. Acidity of all treated soils then slowly decreased. Penetration of acidity in excess of 2 or 3 in. occurred only in series in which the surface soil became so acid that no plant growth

could occur. The presence of free sulfuric acid and soluble salts in the soil solution was evident from the pH values secured. Increases in exchangeable hydrogen at the end of 5 yr. were equivalent to an average of about 60 percent of the acid added. The remainder of the acid must have reacted with nonexchange compounds in the soil, including bases made available by weathering. Single applications of acid to the surface soil is not a practical method for acidifying the subsoil for the control of plant diseases."

Response of plants to boron, copper, and manganese, R. J. Muckenhirn (*Jour. Amer. Soc. Agron., 28 (1936), No. 10, pp. 824–842, figs. 3*).—Some of the results of an investigation reported from the Wisconsin Experiment Station are thus stated:

"In quartz sand cultures, lettuce was unable to continue normal growth or produce a second growth of leaves unless boron was added. Plants showing the typical boron-deficiency symptoms produced new leaves and resumed normal growth after boron was supplied. Milorganite (activated sludge containing some boron) made possible nearly normal growth and increased the boron content of the lettuce. Boric acid prevented the appearance of all deficiency symptoms and doubled the boron content of the plants. Pyrex glass was also a good source of boron. The application of kaolin to quartz sand cultures stimulated the growth of buckwheat and increased its content of manganese, but it inhibited seed production. Extraction of the sand and kaolin with dilute acid indicated that the manganese was obtained from the sand and not from the kaolin. The kaolin probably stimulated the feeding power of the buckwheat. The addition of manganese to the sand increased the yields appreciably.

"Applications of copper and manganese to peat soils in pot cultures increased the growth of onions and sweetclover and the manganese content of the leaves. Some evidence was obtained that copper and manganese affected the relative growth of bulbs and tops and the maturation of the plants as well as the rate of growth. Applications of copper, manganese, and zinc increased the yield of potatoes grown on peat soils in the field. The tubers of potatoes and the bulbs of onions grown on peat treated with copper appeared to be considerably better in quality than those not so treated. Extraction of the soils with dilute acid showed that the peats studied had not more than one-third as much readily soluble manganese per acre as mineral soils. On peat, on which applications of manganese gave no increase in yield, contained more manganese than other peats from the same tract on which onions and potatoes responded to manganese.

"These results suggest that manganese-deficient soils may be identified by means of chemical soil analysis."

Manganese in New Jersey soils, A. W. Blair and A. L. Prince (*Soil Sci., 42 (1936), No. 5, pp. 327–333*).—The authors report from the New Jersey Experiment Stations an investigation of which the results show, in part, that "in general, the percentage of manganese is higher in soils from the northern part of the State than in those from the southern part, that is, those south of the line connecting New Brunswick and Trenton. . . .

"Long-time manure, fertilizer, and lime treatments do not appear to have influenced the manganese content of the soil. In soils from certain of the experimental plats a rather distinct difference was found between the manganese content of the surface soil, that is the A_p horizon, and the A_2 and B horizons, the amount generally decreasing from A_p to the B_1 horizon. . . .

"With slight exception, the manganese content of the crop decreased with increase in the amount of lime applied. In explanation of this, it is sug-

gested that with heavy liming the manganese is rendered less available. . . . The lowered intake of manganese by the plant does not appear to have a deleterious effect with reference to yield."

Farm manure: Its value and conservation, R. C. Collison and H. J. Conn (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 2, pp. 10, 13*).—The unique value of farmyard manure in building up soil fertility and tilth is briefly discussed, and practical suggestions for handling such material in a way to avoid the loss of its most available constituents are made.

Granulated fertilizers have distinct merit, C. B. Sayre (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 2, pp 1, 5, 12*).—The author points out various advantages of the granulated fertilizer over the pulverized form, such, for example, as less rapid loss or fixation in the soil of the more readily soluble components and the more even distribution by drilling machinery, etc. Trials with tomato plants as the test crop showed a very definite increase in the gain in crop weight from a given weight of fertilizer in the granular form.

Profit from fertilizers, H. V. Garner et al. (*London: Crosby Lockwood & Son, 1936, pp. 176, figs. 20*).—"The object of this book is not so much to give a detailed account of fertilizers as to indicate that the use of fertilizers is profitable to the farmer." The book consists of a series of discussions, preceded by a foreword by Viscount Bledisloe and an introduction by H. C. Long. The topics and authors are as follows: The elements of plant nutrition—introduction, and compound and concentrated fertilizers and their use, both by H. C. Long; the nutritional requirement of crops—the classes of fertilizers, the distribution of fertilizers, note on the evaluation of manures, and composition, etc., of fertilizers, all by H. V. Garner; the manuring of permanent and temporary grass and hill pastures, both by R. G. Stapledon; the manuring of arable crops, by F. Rayns; the manuring of fruit crops, by T. Wallace; market garden and flower crops, by A. H. Hoare; and boron and plant disease.

Inspection of fertilizers, W. L. Adams and T. Wright, Jr. (*Rhode Island Sta. Ann. Fert. Circ., 1936, pp. 16*).—In addition to the usual annual report of fertilizer analysis data, showing for the year 1936 an increased use of fertilizer containing 20 percent or more of plant food, the present circular records also the magnesium content, as the oxide, of such fertilizers as carried a guaranty for this element and a statement with respect to every fertilizer of which the analysis is reported showing it to be acid-forming or nonacid-forming.

Concerning the last-named information, the authors note that "it is not intended to condemn acid-forming fertilizers nor to place undue stress on this characteristic. Crop and soil conditions determine the need for the two types of mixtures, and both have a place. Where the acid-forming quality is not desired, however, dolomite or magnesic limestone can replace the relatively inert materials that are usually present as fillers, thus furnishing acid-neutralizing power and magnesium at a very low cost. In a region of acid soils such as are found in Rhode Island, the quantities of liming material so supplied will not be sufficient to take the place of the usual liming program, but should reduce materially the amounts of lime needed over a long period of time."

[**Work with fertilizers, West Virginia Station**] (*West Virginia Sta. Bul. 278* (*1936*), *pp. 22–24*).—Data are reported under the headings lime and fertilizer for field and forage crops, alfalfa's response to degrees of liming (including the slow downward movement of lime in soil), and dolomitic limestone as filler.

Inspection of agricultural lime products for the season of 1936, H. D. Haskins (*Massachusetts Sta. Control Ser. Bul. 87* (*1936*), *pp. 9*).—This is the

twenty-fifth report on the inspection of agricultural lime products in Massachusetts. It gives the composition of the various products which have been sold in the State during the year. The mechanical analysis of the ground limestone products is also recorded.

AGRICULTURAL BOTANY

Illustrated polyglottic dictionary of plant names in Latin, Arabic, *Armenian, English, French, German, Italian,* and *Turkish* languages, including economic, medicinal, poisonous, and ornamental plants and common weeds, A. K. BEDEVIAN (*Cairo: Argus & Papazian Presses, 1936, pp. XV+644+456+[12], pl. 1, figs. 1711*).—Part 1 comprises the dictionary proper, with scientific names alphabetically arranged and each followed by the plant family and the various common names, and appendixes relating to the Arabic transliteration system, Armenian and Turkish alphabets with keys to their pronunciation, the pronunciation of Latin words, a bibliography, and addenda and errata. In part 2, indexes of common names of plants are given for each of the eight languages included, and, for convenience in locating, the index for each language is on paper of a different color.

A preface by W. L. Balls is included.

Methods in plant physiology, W. E. LOOMIS and C. A. SHULL (*New York and London: McGraw-Hill Book Co., 1937, pp. XVIII+472, figs. 94*).—"This volume is an attempt to bring together material which will be useful alike to the instructor in biology or plant physiology, to the student in plant physiology, and to the research worker in plant physiology, farm crops, forestry, genetics, and horticulture."

In part 1, laboratory exercises, the subject matter is discussed under chapter headings of the water relations of plants, transpiration, plant nutrients, the role of diffusion in plants, colloidal phenomena in plants, photosynthesis, plant pigments, plant foods, respiration, plant enzymes, growth and movement, and growth-differentiation balance and growth correlation. Part 2, general methods, deals with general laboratory procedures, the chemical analysis of plant materials, the estimation of sugars, polysaccharides, nitrogen, and plant lipids, plant ash, physical measurements, and measurement and control of plant environment. A chapter on statistical methods, by G. W. Snedecor (pp. 383–416), is included.

An appendix contains 33 tables giving various quantitative data, formulas, etc. An index is provided.

An introduction to the principles of plant physiology, W. STILES (*London: Methuen & Co., 1936, pp. VIII+615, pls. 5, figs. 55*).—This text is addressed more particularly to university students. In it the purely biochemical details are introduced only insofar as reference to them has appeared essential to an understanding of the physiology of the plant. The subject matter is arranged under the general physiology of the cell, metabolism, the physiology of development, and irritability and movement. The literature references cover over 39 pages, and an index completes the work.

Plant physiology: Experiments and observations on higher and lower plants, including bacteriology and hydrobiology (with plankton), R. KOLKWITZ (*Pflanzenphysiologie: Versuche und Beobachtungen an höheren und niederen Pflanzen einschliesslich Bakteriologie und Hydrobiologie mit Planktonkunde. Jena: Gustav Fischer, 1935, 3. ed., rev., pp. VI+310, pls. 14, figs. 175*).—Under part 1, phanerogams, the text discusses the essential elements and nutrient salts; chlorophyll and its function; diffusion, osmosis, and turgor; sugar, starch, reserve cellulose, and fatty oils; protein; water and air; respi-

ration; growth, movement, and irritability; and reproduction and inheritance. Part 2, cryptogams, treats of the plant groups from Myxomycetes and Schizomycetes through to the Pteridophyta and includes the ecology of bodies of water.

Morphology of vascular plants: Lower groups (Psilophytales to Filicales), A. J. EAMES (*New York and London: McGraw-Hill Book Co., 1936, pp. XVIII+433, figs. [216]*).—This textbook is intended to "make more readily available the important facts and theories in this field as known and interpreted today. . . . The viewpoint is that of broad comparative study, with the development of a natural classification and phylogenetic relationships as the goal." The order of arrangement follows that found by experience to be most satisfactory, though in general the more primitive forms are discussed first. A final general chapter takes up the plant body, alternation of generations, and the classification of vascular plants. Bibliographies are given at the ends of individual chapters, and a general bibliography and index complete the work.

Practical photo-micrography, J. E. BARNARD and F. V. WELCH (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1936, 3. ed., pp. XII+352, pls. 23, figs. 121*).—A thorough discussion of the optical principles involved, types of instruments and illuminants available, and technical methods employed in photomicrography is brought up to date in this edition.

An electrically heated needle for paraffin embedding, A. C. FABERGÉ and L. LA COUR (*Science, 84 (1936), No. 2171, p. 142, fig. 1*).—A sewing needle in handle is heated by nichrome wire at low voltage.

[Botanical studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 91, 92, 93, 96, 97*).—Progress reports are included on the following studies: Investigations on delayed photosynthesis in chlorophyll-bearing embryos of orchids, and other studies on orchid seed, by L. Knudson; influence of X-rays on the growth and metabolic processes in ferns, and effect of light and other factors on reproduction in certain fern prothallia, both by Knudson and H. T. Scofield; relation of manganese to plant growth, by E. F. Hopkins; the translocation of solutes in plants, by O. F. Curtis, I. H. Stuckey, E. M. Palmquist, and C. A. Moose; the production of tetraploid strains of teosinte, in cooperation with the U. S. Department of Agriculture, by L. F. Randolph; the oxygen supply and requirements of bacteria, by O. Rahn and C. P. Hegarty; and mitogenetic radiation, by Rahn and A. J. Ferguson.

The plant cell: Lectures on normal and pathological cytomorphology and cytogenesis, E. KÜSTER (*Die Pflanzenzelle: Vorlesungen über normale und pathologische Zytomorphologie und Zytogenese. Jena: Gustav Fischer, 1935, pp. XII+672, figs. 323*).—The text of this monograph is presented under the main headings of protoplasm, the cell nucleus, plastids, vacuoles, starch grains, crystals and other cell inclusions, the cell membrane, and the development of the cell (including sizes, forms and growth of cells, cell division, fusion of cells, regeneration, symbiosis, and cell age and death). Author and subject indexes complete the work.

Investigations on the formation of the cell wall [trans. title], K. HESS, C. TROGUS, and W. WERGIN (*Planta, Arch. Wiss. Bot., 25 (1936), No. 3, pp. 419–437, figs. 15*).—A study of the cytology and chemistry of cell wall development in cotton root hairs, oat coleoptiles, and young beech shoots is reported, using X-ray and polarization methods.

The results of some attempts at the in vitro culture of isolated plant cells [trans. title], L. MAROTTA (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat., e Nat., 21 (1935), No. 3, pp. 211–215*).—In numerous experiments car-

ried out on plants of widely separated groups, isolated cells in pure culture under sterile conditions have undergone survival, organization, and increase in size but never the phenomenon of cell division, since in no case have mitotic figures been observed.

The concentration of solutes in sap and tissue, and the estimation of bound water, T. G. MASON and E. PHILLIS (*Mem. Cotton Res. Sta., Trinidad, Ser. B, Physiol., No. 8 (1936), pp. 437–454*).—As there was no indication of the presence of bound water in the expressed sap, using the cryoscopic method, it is suggested that the discrepancy in the sap and tissue estimates of the concentration of solutes (sugar and chlorine) was due to the presence of bound water in the tissue. Studies of the estimation of bound water and its application to the estimation of sap-soluble materials are discussed. No evidence of the adsorption of sucrose or chlorine was obtained.

The communication of the pneumatic systems of trees with the atmosphere, D. T. MACDOUGAL (*Amer. Phil. Soc. Proc., 76 (1936), No. 6, pp. 823–845, fig. 1*).—The results of studies with an apparatus developed to measure the rate of streaming of atmospheric gases into the interior of living sections of woody stems established the presence of passages from the pneumatic system of trees across the cambium which were too small to allow streaming movements of watery solutions. The amount of suction necessary to initiate and maintain a flow of gases through these ducts varied from 5 to 30 mm of mercury in various trees. In some cases (e. g., *Salix*) sap-filled layers of wood were taken to affect the rate of streaming.

Variations in barometric pressure, in tensions of the meshwork of sap conduits, and in liberation of CO_2 from living cells and woody walls are factors which may set up differences in pressure and initiate streaming movements. Movements of gases outwardly or inwardly through the cambium tend to equalize the pressure and composition of the pneumatic system and the outside air, thus constituting a means of ventilation.

The measurements of the rates of flow were made on young stems, while determinations of the composition of the gases of pneumatic systems were made on samples extracted from large or old trunks. The determination of rates of flow in the latter case would require different methods from those described.

A study of certain factors influencing the movement of liquids in wood, S. J. BUCKMAN, H. SCHMITZ, and R. A. GORTNER (In *Colloid Symposium Monograph. XI*, edited by H. B. WEISER. *Baltimore: Williams & Wilkins Co., 1935, pp. 103–120, figs. 7*).—This is a contribution by the Minnesota Experiment Station, noted from another source (E. S. R., 75, p. 601).

Some effects of light on the growth, flowering, rooting, and budding of various plants [trans. title], P. CHOUARD (*Compt. Rend. Acad. Sci. [Paris], 202 (1936), No. 17, pp. 1454–1457*).—Experiments are briefly described on the effects of light intensity, duration, and quality on radish, spinach, bean, hybrid *Calceolaria*, peas, and *Brimeura* (ex *Hyacinthus*) *amethystina*. The advantages of supplementary illumination by an appropriate light, at optimum temperature, are stressed both in relation to precocity of flowering and to the processes of vegetative propagation.

The study of the effect of blue-violet rays on photosynthesis, R. H. DASTUR and R. J. MEHTA (*Ann. Bot. [London], 49 (1935), No. 196, pp. 809–821*).—The rate of photosynthesis was studied in the light of an incandescent oil lamp, a 1,500-w. gas-filled lamp, a "daylight" lamp, and a carbon arc lamp. The intensity of the blue-violet region in these four lamps increases in the order given, and the results of the study indicated that the photosynthetic rate also

increases in the same order. Thus the importance of the blue-violet region of the visible spectrum is demonstrated.

The photosynthetic activity of sunlight was highest in white light, intermediate in red light, and very feeble in blue-violet light. Both the red and the blue-violet regions are deemed necessary to normal photosynthetic activity, and even with white light the assimilation depends not only on the total energy content but also on the distribution of radiations of different wavelength.

Effect of atmospheric humidity on rate of carbon fixation by plants, J. W. MITCHELL (*Bot. Gaz., 98 (1936), No. 1, pp. 87–104, figs. 4*).—The rates of carbon fixation by leaves of squash, wax bean, cabbage, *Pelargonium*, *Primula*, and tomato were not affected by a rapid decrease in the humidity of the ambient air or by prolonged exposure (from 15 to 20 hr.) to low humidity. Attached leaves of such plants remained turgid at moderate temperatures, even at extremely low humidities, but *Cineraria* leaves in some cases wilted and the loss of turgidity was always accompanied by a decreased rate of carbon fixation. Air temperatures above 30° C. retarded the rate of carbon fixation by *Pelargonium* leaves in both moist and dry air.

Under the test conditions, the maximum size of stomatal openings on tomato and *Pelargonium* generally occurred at relative humidities above 60 percent. Their size decreased with a lowering of air humidity, and the stomata usually appeared closed below 30 percent.

Carbon fixation was not greatly affected by wide variations in the size of stomatal openings. Leaves of tomato and *Pelargonium* absorbed CO_2 and accumulated carbohydrates in appreciable amounts even when the stomata appeared closed. That CO_2 was absorbed under these conditions was shown, since the amount fixed by leaves with apparently closed stomata was approximately equal to that fixed by the same leaves with open stomata, by the iodine test starch was found to accumulate in leaves exposed to relatively dry air with their stomata apparently closed, and the acid-hydrolyzable carbohydrates in *Pelargonium* leaves grown in relatively dry air increased approximately 41 percent in 6 hr., although their stomata appeared to be closed.

A bibliography of 20 titles is included.

Control of atmospheric humidity in culture studies, H. HOPP (*Bot. Gaz., 98 (1936), No. 1, pp. 25–44, figs. 11*).—The quantitative method (easily set up and inexpensive) is recommended for small, closed chambers, and the qualitative method (simple and requiring little equipment and care) for both closed and fresh-air chambers. The physical control method by continuous vaporization is useful for a saturated atmosphere, but the additional apparatus required to secure relative humidities between 0 and 100 percent usually renders it inapplicable to culture studies. Intermittent vaporization proved most useful for large chambers, control being effected by a hygrostat and a humidifier, as described. Humidity control by physical methods was effective between 15° and 40° C.

Activity of the vascular cambium in relation to wounding in the balsam poplar, Populus balsamifera L., A. B. BROWN (*Canad. Jour. Res., 15 (1937), No. 1, Sect. C, pp. 7–31, pl. 1, figs. 9*).—In disbudded units, the greater the amount of living bark distal to the wound the greater was the development of local cambial activity in relation to the wound. Local wound cambial activity was further promoted by the presence of developing buds and leaves distal to the wound. Cambial activity in relation to wounding responded to gravity like normal cambium. In horizontally placed leader shoots, cambial activity was greater in relation to a wound on the upper side of the shoot than to a similar wound opposite on the lower side. It is suggested that a hormone in the living

bark and also produced by developing buds and leaves is involved in local wound cambial activity. Probably this hormone is identical with that promoting normal cambial actvity.

It is also suggested that a wound substance capable of promoting itself only by cell division is involved in local wound cambial activity, and the amount produced is apparently proportional to the extent of dying of cells of the bark after wounding. From the lower edge of a complete ring a very feeble basipetal gradient of cambial activity arises in which differentiation to form vessels and fibers fails to occur, though a few tracheids may be found. This is believed to be the first report of such behavior, and it is interpreted to result from stimulation of the cambial layers by the wound substance alone. Local cambial activity above a complete ring and in relation to bridged wounds involves differentiation of more or less typical vessels and fibers, interpreted to result from interaction between the wound substance and the cambial hormone traveling basipetally in the living bark cells. The absence or feebler development of cambial activity at certain points in relation to bridged wounds, in contrast to greater development at other points where the concentration of cambial hormone is presumed to be less, is interpreted to result from a lack or low concentration of wound substance acting as a limiting factor.

Germination behavior of some California plants, N. T. Mirov (*Ecology, 17 (1936), No. 4, pp. 667–672*).—In this contribution by the California Experiment Station, the germination experiments (covering over 300 species of 64 families) are considered to justify the following conclusions: There is no consistent relation between systematic position and germination behavior, but certain tendencies within families are clearly indicated. There is a definite correlation between germination behavior of species and altitudinal distribution, failure to germinate owing to seed coat conditions being found mostly at low elevations. The need for prolonged low temperature before germination, supplemented by abundant moisture, was most common in seeds grown at high elevations, though such conditions were in many cases necessary for seeds of plants of medium and low elevations.

In annuals, when delayed germination occurred it was due to seed coat conditions alone. In herbaceous perennials it was due either to the need for afterripening at low temperatures or to seed coat conditions. Woody perennials were the most complex group, delayed germination being due to seed coat conditions, need for afterripening at low temperatures, or to a combination of both.

Comparative anatomy of the seeds of cottons and other malvaceous plants, I, II, R. G. Reeves (*Amer. Jour. Bot., 23 (1936), Nos. 4, pp. 291–296, figs. 18; 6, pp. 394–405, figs. 52*).—This is a contribution by the Texas Experiment Station, part 1 dealing with the Malveae and Ureneae, and part 2 with various species of *Gossypium* and related species.

Further studies on transport in the cotton plant, V, VI, T. G. Mason and E. Phillis (*Mem. Cotton Res. Sta., Trinidad, Ser. B, Physiol., Nos. 8 (1936), pp. 455–499, figs. 20; 9 (1936), pp. 679–697, figs. 6*).—Two papers are included:

V. *Oxygen supply and the activation of diffusion.*—As a result of this study "it is suggested that the mechanism activating diffusion consists in some special organization in the cytoplasm, maintained by metabolic energy, whereby the resistance to solute movement is so reduced that materials diffuse in the sieve tube at rates comparable with those in a gas."

VI. *Interchange between the tissues of the corolla.*—"The reversal of the direction of transport in the corolla is explained as follows: Solutes move between the phloem and the parenchyma between the veins to maintain the

distribution determined by the relative solvent capacities of the two tissues. Continued movement from the phloem into the parenchyma is ensured during development by the maintenance of low concentrations as a result of utilization and of the intake of growth water. After anthesis the cessation of utilization would lead to a cessation of import. With the onset of protoplasmic decomposition and the drying out of the tissues, the concentration in the parenchyma rises and solutes move back into the phloem. If the solvent capacity of the parenchyma declines with age, another factor promoting export from the parenchyma would be introduced."

Seasonal changes in the carbohydrates of the wheat plant, H. R. Barnell (*New Phytol., 35 (1936), No. 3, pp. 229–266, figs. 9*).—The percentage amounts of various carbohydrates in the Rivets and Wilhelmina wheat varieties collected at sunrise through two seasons indicated well-defined developmental drifts. During winter and early spring the drifts of some of the carbohydrates (particularly sugars) were somewhat obscured by environmentally induced effects, but it was possible to obtain a clear picture of the drifts throughout the season and to note the nature of the complications caused by weather factors. These are discussed in detail.

The sugars occurred in the following order of percentage amounts: Sucrose, glucose, and fructose. Both varieties responded to low temperatures by increases in sugar concentration (particularly sucrose). Starch was absent from stems and leaves at all times, but glucose- and pentose-yielding polysaccharides were present. Starch was definitely formed only in the ears. There was practically no significant difference in the carbohydrate contents of the two varieties. Wilhelmina was more sensitive in its sucrose reaction to low temperatures than Rivets. The ears of Wilhelmina started to ripen more rapidly than those of Rivets, but the latter, after a lag period, ripened more rapidly and tended to catch up.

The chemotropism of the plant root, I, II [trans. title] (*Biochem. Ztschr., 286 (1936), No. 1–2, pp. 110–127, figs. 2*).—The following parts are included:

I. *The chemotropic stimulation of roots by mineral salts*, B. Niklewski and J. Duda (pp. 110–119).—In the tests reported the excitant was incorporated in a small agar block placed beside the root tips of *Sinapis alba*. After from 4 to 5 hr. of action the direction of growth of the root, overcoming the geotropic stimulus, became altered. The curvatures were almost exclusively positive, and the few cases of negative bending could be attributed to pathological causes. The phosphate ion had a strongly positive action and the NO_3 ion a weaker effect. In addition to potassium, the cations acting most strongly were Hg¨, Al¨', Fe¨', and UO_2¨. Not only the electrolytes but various organic substances (e. g., eosin and methyl violet) exhibited a strong chemotropic action on the root tip.

II. *The chemotropic stimulation of roots by colloidal substances*, B. Niklewski, H. Brodowska, M. Dydo, and M. Kahl (pp. 120–127).—The results given indicate that not only molecular but also colloidal solutions may induce chemotropic stimulation. A quartz suspension with a maximum particle size of 0.002 mm induced no chemotropic reaction, but colloidal solutions of gold, silver, ferrous hydroxide, copper, and sulfide of arsenic, with size of particles below 100 mμ, called forth very distinct chemotropic curvatures. Solutions of mastic and of gamboge reacted similarly, and strong chemotropic stimulations were induced by the humus colloids contained in stable manure. As soon as the solutions coagulated (determined for gold and silver solutions) they lost this power. On the contrary, the hydrosols of agar, albumin, and edestin, the particles of which are invisible even submicroscopically, called forth no chemotropic reac-

tions. Although crude egg white causes these reactions, their origin is explained on the basis of various substances other than the albumin contained therein.

The basis of this type of stimulation by colloidal substances is believed to lie in the impact of the particles on the root cells rather than in the penetration of the cells, as is assumed for the ions of molecular solutions. However, only particles of a certain size act as chemotropic stimuli.

Investigations on the action of the natural growth-promoting substances and of β-indolylacetic acid on the metabolism of plants [trans. title], G. Friedrich (*Planta, Arch. Wiss. Bot., 25 (1936), No. 4, pp. 607–647, fig. 1*).—The experiments were perfomed on *Helianthus*.

The conduction of growth-promoting substances in plants, I, II [trans. title], F. Laibach and O. Fischnich (*Planta, Arch. Wiss. Bot., 25 (1396), No. 4, pp. 648–659, figs. 11; 26 (1936), No. 1, pp. 81–89, figs. 5*).—The first paper describes tests carried out with red coleus and cucumber. The second describes a method for determining the rate of transmission of β-indolylacetic acid (heteroauxin) in intact plants (*Cucumis sativus*).

Auxin and correlative inhibition, B. Le Fanu (*New Phytol., 35 (1936), No. 3, pp. 205–220, figs. 2*).—Axillary buds of pea (*Pisum sativum*) on single-node stem cuttings and the growth of young stems were inhibited when the ends were placed in heteroauxin solution. Growth of young internodes was also inhibited by lanolin containing heteroauxin placed on the stem in a position morphologically below them, although their growth was accelerated by the same treatment applied above. Leaves protected a stem against heteroauxin inhibition. Buds of cuttings were inhibited by heteroauxin in gelatin applied to the cut ends of the stems above or below them, but more strongly when applied above. Little or no auxin was present in an inhibited shoot. A completely inhibited shoot transported auxin only feebly, if at all, in either direction.

It is concluded that inhibition of lateral buds and shoots is probably a secondary process originating from some positive primary process promoted by auxin in the inhibiting shoot.

Leaf movements under the influence of artificially applied growth substances [trans. title], F. Laibach and O. Fischnich (*Biol. Zentbl., 56 (1936), Nos. 1–2, pp. 62–68, figs. 3*).—These tests were carried out in the greenhouse with coleus and tomato plants subjected to the action of β-indolylacetic acid used as a paste and with lanolin alone applied in the controls.

Vitamin B_1 and the growth of excised tomato roots, W. J. Robbins and M. A. Bartley (*Science, 85 (1937), No. 2201, pp. 246, 247*).—Work at the University of Missouri showed that excised tomato roots will grow indefinitely in White's solution (E. S. R., 72, p. 185) where the yeast is replaced by natural crystalline vitamin B_1 Merck or by synthetic B_1 Merck, the first-mentioned vitamin being effective at the great dilution of $1\times10^{-4}\gamma$ in 50 cc. It is suggested that normally the tomato root depends on the top part of the plant not only for carbohydrate but also for vitamin B_1.

Can the Klebs theory relative to the dependence of blossom formation on the chemical composition of the plant be maintained? [trans. title] H. Knobel (*Ztschr. Bot., 29 (1936), No. 10–11, pp. 499–501, figs. 12*).—This is a theoretical and analytical study and review, with a literature list of 54 titles. The experiments conducted with oats, spinach, lettuce, rudbeckia, and chrysanthemum failed to indicate any influence of the nitrogen: sugar ratio or of the phosphorus picture on blossom formation. The relationship of organic to inorganic substances depended on the intake of light during development, but no

characteristic relationship to the time of formation of the blossom anlage was found.

The mineral absorption of higher plants as function of a correlation between inner and outer factors [trans. title], O. SCHMIDT (*Ztschr. Bot.*, *30 (1936), No. 7–8, pp. 289–334, figs. 14*).—The experiments were performed on *Sanchezia nobilis*, *Helianthus annuus*, *Impatiens* spp., *Tropaeolum aduncum*, *Zea mays*, *Sicyos angulata*, *Cyclanthera* spp., and *Cucumis sativus*. A bibliography of 24 references is included.

Comparative content in sulfur and phosphorus of plants grown on the same soil [trans. title], G. BERTRAND and L. SILBERSTEIN (*Bul. Soc. Chim. France, Mém., 5. ser., 3 (1936), No. 4, pp. 625–628*).—This paper gives data essentially the same as previously noted (E. S. R., 75, p. 317).

Semisolid media for cultivation and identification of the sporulating anaerobes, R. S. SPRAY (*Jour. Bact., 32 (1936), No. 2, pp. 135–155*).—This is a contribution by West Virginia University.

The indol tolerance of certain strains of the colon-aerogenes group, R. L. FRANCE (*Jour. Bact., 32 (1936), No. 2, pp. 211–214*).—This is a contribution by the Massachusetts Experiment Station.

Essential growth factors for propionic acid bacteria, I, II (*Jour. Bact. 32 (1936), No. 2, pp. 157–174, figs. 4*).—These two papers from the University of Wisconsin are entitled, respectively, Sources and Fractionation, by E. L. Tatum, W. H. Peterson, and E. B. Fred (pp. 157–166), and Nature of the Neuberg Precipitate Fraction of Potato: Replacement by Ammonium Sulphate or by Certain Amino Acids, by E. L. Tatum, H. G. Wood, and W. H. Peterson (pp. 167–174).

Root nodule bacteria of some tropical leguminous plants.—I, Cross-inoculation studies with Vigna sinensis L., O. N. and E. K. ALLEN (*Soil Sci., 42 (1936), No. 1, pp. 61–74, pls. 2*).—This report by the Hawaiian Pineapple Producers' Experiment Station presents the results of observations on nodule formation on various leguminous plants and cross-inoculation tests with these plant species. The versatility of the now so-called cowpea group is further emphasized by the addition of various distantly related leguminous plants as a result of rigidly controlled plant inoculation tests (34 species of the Mimosoideae, 3 of the Caesalpinioideae, and 54 of the Papilionoideae). The present state of the cowpea group is briefly discussed.

The abnormal structure induced in nodules on lucerne (Medicago sativa L.) by the supply of sodium nitrate to the host plant, H. G. THORNTON and J. E. RUDORF (*Roy. Soc. [London], Proc., Ser. B, 120 (1936), No. 817, pp. 240–252, pls. 3, figs. 3*).—"Microtome sections of the nodules revealed the following abnormalities which were associated with the supply of nitrate to the host plant: (1) The cell walls of the distal cap were very much thickened, the cell wall material often projecting into the cells in the form of concretionlike lumps. These thickened walls and the lumps gave the same microchemical reactions as did the thin cell walls of the normal tissue. The cell contents were usually reduced and the nuclei greatly shrunken. (2) The endodermis that surrounds the central tissue of the nodule and also that which ensheathes the vascular strands were abnormally thickened by a deposition throughout the cell walls of material giving the suberin reaction with scharlach R. (3) There was an increased tendency towards necrotic decay of the central bacterial tissue, and where this did not occur the cell contents were usually much reduced. (4) In the younger portions of the bacterial tissue, the bacteria occur principally in the coccus stage of their life cycle, a stage usually associated with food deficiency."

GENETICS

The principles of heredity, L. H. Snyder (*Boston and London: D. C. Heath & Co., [1935], pp. XIII+385, [pls. 3], figs. [150]*).—A textbook presenting the principles of genetics, with special reference to animals and man.

A cytogenetic study of a chromosome fragment in maize, M. M. Rhoades (*Genetics, 21 (1936), No. 5, pp. 491–502, figs. 5*).—A corn plant intermediate in appearance between the trisomic and disomic individuals appeared in the progeny of a plant trisomic for chromosome V in cooperative studies by the Iowa Experiment Station and the U. S. Department of Agriculture, and carried a fragment of chromosome V besides the normal complement of 20 chromosomes. The fragment consisted of the entire short arm of chromosome V with a terminal spindle fiber insertion region.

The fragment chromosome was associated with the two normal chromosomes in about one-half the cells. Segregation of the three members of the trivalent groups was not random, but in such a manner that the fragment chromosome usually accompanied a normal when it passed to a pole. The spindle fiber insertion region of the fragment chromosome was observed to be split or double in cells where it was lying free in the nucleus as a univalent. The equational split into two chromatids was clearly evident. The V_1, Ys, Pr, V_{12}, V_2, and Bt_1 loci were located in the long arm of chromosome V, while the Bm_1 and A_2 loci were located in the short arm of the chromosome. Pollen hyperploid for the fragment chromosome occasionally functioned in competition with haploid pollen. Crossing over in certain regions seemed more frequent in fragment plants than in diploids.

The histological background for dwarfism in Zea mays, L. B. Abbe (*Amer. Phil. Soc. Proc., 76 (1936), No. 5, pp. 743–747, pls. 2, figs. 4*).—Measurements made on 18 cultures segregating for dwarf or dwarflike types of corn, including 9 dwarf types grown at Cornell University, and on other dwarf types and their normal sibs provided from other sources, included length of tassel and of internodes; diameters (at right angles) of the upper, middle, and lower part of each third internode; lengths of leaf sheaths and blades; and leaf blade widths at various points. Normal and dwarf plants are compared graphically and discussed. Although generalizations are not attempted, it is pointed out that a suggestive relation between cell and gross internode diameters was apparent in some cases.

Cytological studies on the peanut, Arachis.—II, Chromosome number, morphology, and behavior, and their application to the problem of the origin of the cultivated forms, L. Husted (*Cytologia, 7 (1936), No. 3, pp. 396–423, figs. 56*).—Further studies are reported (E. S. R., 71, p. 758).

Consideration of the basic chromosome numbers present in the legume family indicate that *A. hypogaea* is a polyploid species. The chromosome number of 115 plants representing 33 species, varieties, lines, and F_1, F_2, and F_4 varietal hybrids is reported as 20 (n) or 40 ($2n$). An exceptional plant contained 41 somatic chromosomes and a small fragment. The 116 plants examined showed the presence of 2 chromosomes morphologically distinguishable from the others because of their smaller size. One strain of Spanish, 1 of runner, and 9 F_4 plants of a Spanish × runner cross showed the presence of chromosome pair "A" and a second pair, "B", the chromosomes of which possess a subterminal attachment constriction and a conspicuous secondary constriction.

In the cultivated peanut (*A. hypogaea*), chromosome association during meiosis in varieties and varietal hybrids is usually seen as 20 normal bivalents. Other configurations such as trivalents, quadrivalents, quinquevalents,

sexivalents, and an association of 10 chromosomes are occasionally formed. It appears to be a species in which deviations from the 40 somatic number seldom occur. The origin of bunch and runner type forms of the commercial peanut is discussed in the light of the cytological results. In that their chromosome number, morphology, and behavior are essentially similar, and the chromosomes of these two peanut types are seen to be homologous each to each notwithstanding possible minor changes, it is concluded that they, as well as *A. nambyquarae* and *A. rasteiro*, have been derived from a common origin.

Studies on the inheritance of carotene in carrots, S. L. Emsweller, P. C. Burrell, and H. A. Borthwick (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 508–511, fig. 1*).—Among interesting findings in this study, conducted by the California Experiment Station at Davis, were that there is much more carotene in the phloem than in the xylem of the roots and the amount of carotene is greater in both the xylem and phloem at the top than at the base of the root. Apparently carotene accumulates rapidly at the top until a limit is reached, after which accumulation progresses downward. A high correlation was noted between the color of the tissue and its carotene content. Colorimeter readings on the total extracted pigments before the separation of carotene and xanthophyll was effected were correlated very consistently with carotene content. In comparing the carotene content of a commercial Danvers stock with a strain inbred for four generations, it was found that the inbred line was much less variable. Notable differences were found in the carotene content of different inbred lines.

The inheritance of a green flowered variation in Cucumis sativus, A. E. Hutchins (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 513*).—Attempts to self-fertilize a green flowered variant characterized by hypertrophied stamens in the male flowers and larger ovaries and stigmas in the female flowers led to no fruits with seed. No success was secured in crosses in which the green variant was used as the ovule parent, but there was good success when the green variant was used as the pollen parent and other inbred lines as the ovule parent. The results indicate that the green flower is inherited as a recessive character whose expression is due to a one-factor difference.

The interaction of the blue and green color factors in Hubbard squash, A. E. Hutchins (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 514*).—Crosses made at the Minnesota Experiment Station in 1932 between self-fertilized lines of Green and Blue Hubbard squash yielded F_1 progeny of light green color intermediate between the two parents. In the F_2 and backcross populations, the size and shape of fruits ranged between those of the two parents. Green color was apparently partially dominant to blue.

The uniform fruit color gene in the tomato, A. F. Yeager (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 512*).—Stating that the factor of uniform fruit color is a simple recessive not possessed by any important tomato variety, the author discusses results of crosses at the North Dakota Experiment Station of the Bison tomato with an unnamed variety possessing the uniform fruit color gene. Certain seedlings were obtained which were characterized by great earliness, small determinate vines, red flesh, good size, uniform fruit color, and apparently unusual resistance to heat and drought.

Apple breeding: An example of parental prepotency in two progenies of the Delicious apple, H. L. Lantz (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 10–12*).—Observations by the Iowa Experiment Station on the progenies of two apple crosses—Antonovka × Delicious and Black Annette × Delicious—produced in the same year and grown under comparable conditions, showed

striking contrasts. In the young trees, the 134 trees of the first cross included 84.4 percent of very good and good grades, whereas the 94 trees of the second cross contained only 17 percent of good and no very good trees. Other progenies of Antonovka crossed with King David, Ashton, Grimes Golden, and Jonathan also showed marked vigor, indicating that Antonovka carries a group of dominant growth genes and approaches a homozygous condition for factors producing vigorous growth. Black Annette × Anisim produced poor trees indicating that Black Annette represents a genetic complex lacking in a capacity to produce strong growth factors in the progeny.

Hybridization of animals, A. S. SEREBROVSKIĬ (*Gibridizat͡sii͡a zhivotnykh. Moskva: Gosud. Izdatel., 1935, pp. 290, pls. 4, figs. 99*).—Results are presented in this Russian publication of species crosses produced in animals, the comparative fertility of hybrids, and the use of methods of artificial insemination in bringing about crosses.

The genetics of cattle.—I, A survey of the literature upon the inheritance of milking capacity, A. D. BUCHANAN SMITH and O. J. ROBISON (In *Bibliographia Genetica, 's Gravenhage (The Hague): Martinus Nijhoff, 1933, vol. 10, pp. 1–104*).—A review is presented of research dealing with the inheritance of milk production, persistency and milk composition in dairy cattle as related to conformation, color, progeny testing, inbreeding, relative importance of the two parents, and the number of genetic factors involved. On account of the differences expressed by numerous investigators as to the mode of inheritance of production, it was impossible to come to a single conclusion. Mention is also made of the influence of many environmental and nutritional factors.

Contingent relations between blood groups and milk production in cattle [trans. title], C. KRONACHER and F. HOGREVE (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 35 (1936), No. 1, pp. 89–93*).—Study of the milk and fat production records of 111 cows in 3 herds with reference to the 9 blood types showed that the production of those in the Oo group was below the average in all three herds. There was some tendency in two of the herds for cows having different serum agglutinating properties to show relatively high production in comparison with the rest of the herd.

Horn inheritance in Galloway-Holstein cattle crosses, W. T. WHITE and H. L. IBSEN (*Jour. Genet., 32 (1936), No. 1, pp. 33–49*).—In reciprocal crosses of Galloway and Holstein cattle at the Alaska Experiment Station, there were produced in the F_1 generation 12 polled females, 8 polled males, and 5 males with scurs. None of the 29 F_2 animals and only 1 F_3 had scurs. To account for these results and those obtained by other workers, a hypothesis is presented from the Kansas Experiment Station explaining the inheritance of horns and scurs.

"All cattle are assumed to be homozygous for the horned gene, *H*. Polled animals carry a dominant gene, *P*, which is completely dominant to *p* (absence of polled) and also completely epistatic in both sexes to *H*. Two other factors are postulated, *Ha* ("African" horns) and *Sc* (scurred). The latter is sex-limited to the extent that in both the heterozygous and the homozygous condition it is epistatic to *P* in males, while it is epistatic only in those females that are homozygous for the gene. A similar relationship applies to *Ha*, except that it has not yet been determined whether or not homozygous *Ha* females carrying *P* are horned. In nonpolled (*pp*) animals *H* is epistatic to *Sc* in both sexes and apparently is epistatic to *Ha*, although it is quite conceivable that *H* and *Ha* each has a modifying effect on the other, making the epistacy incomplete."

The operation of these factors in matings is discussed in connection with the results of other investigators and the appearance of genes *Ha* and *Sc* in Hereford cattle and mutations of these and the other genes. Evidently the gene *P* is not linked with the black or self-color genes.

The silver gray color in Indian cattle, A. O. RHOAD (*Jour. Heredity, 27 (1936), No. 3, pp. 113–118, figs. 4*).—Study of the Guzarat and Nellore breeds of Indian cattle in Brazil showed that the hair of these cattle is characterized by a nonpigmented tip, producing a silver gray effect in the coat pattern. Based on crosses of Guzarats with Holsteins, it appears that the self-pattern of the Guzarat is dominant to Holstein spotting, but the total pigmented hair (*Tp*) of the Holstein was dominant to the tipped or bicolored condition. The width of the tip is assumed to be controlled by plus and minus modifiers. The tipped condition of the hair is characteristic of the Guzarat, Nellore, Scindi, Jersey, and Brown Swiss cattle, while the Angus, Holstein, Red Polled, and Shorthorn are characterized by the unicolored type of hair.

A case of extreme sex-modification in an adult bovine free-martin, A. BUYSE (*Anat. Rec., 66 (1936), No. 1, pp. 43–58, figs. 3*).—Modification in the sexual organs of a 30-month-old free-martin, born with 2 males in a set of triplets, are described. A penislike structure 26 cm long was in a highly contorted condition ventral to the vestibule and urinogenital sinus and terminated in a large glans penis. Germ cells were absent in the gonads, which contained seminiferous tubules, undifferentiated medullary cords, and rete. The vasa deferentia emptied into the urogential sinus. There were well-developed seminal vesicles but no trace of a uterus or a vagina. The males are considered as the reason for the extreme sex reversal in the female.

The experiments of T. H. Riches concerning the production of monsters in cattle, R. C. PUNNETT (*Jour. Genet., 32 (1936), No. 1, pp. 65–72*).—To ascertain if the lethal monsters occurring in Dexter and Telemark cattle are due to the same or different genes, a Telemark bull, carrying the recessive lethal of the breed, was mated to Dexter cows. There were produced 24 calves and 1 mummy, but none were of the monster type. It is concluded from these results that the monsters in the two breeds are due to different genetic factors. Confirming this, among 11 F_2 progeny there were produced 3 Dexter-type and 1 Telemark-type monsters.

The data on the structure of the testes of hybrids of yak and cattle, A. I. ZUITIN and V. V. IVANOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1936), No. 2, pp. 75–77*).—Hybrid males between yaks and cattle exhibited similar disturbances in germ cell formation in those that were produced in the first cross and by backcrossing F_1 females to bulls. Spermatogenesis reached a more advanced stage in a backcross produced by mating an F_2 female to a full-blooded yak. Mature sperm appeared in small amounts, but mobility and fertility was not determined.

On the chromosomes of the yak (Poephogus grunniens L.), A. I. ZUITIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1935), No. 1–2, pp. 81–83, fig. 1*).—The diploid number of chromosomes in the yak was found to be 64, with the Y chromosome presumably the smallest. The fact that cattle have 60 chromosomes is suggested as the reason why males of yak-cattle crosses are sterile.

The inheritance of swine colors in race crosses [trans. title], J. SCHMIDT (*Forschungsdienst, 1 (1936), No. 3, pp. 205–217*).—A summary of color inheritance in breed crosses.

Contribution to inheritance in swine in the first cross [trans. title], D. DSCHAPARIDSE (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 34*

(*1936*), *No. 3*, *pp. 335–347*, *figs. 6*).—Comparison of the characters of Hannover-Braunschweigisches Landschwein and White German Edelschwein and the crosses between them showed that the sow was solely responsible for the duration of the gestation period and the size of the litter, and the boar had no influence on them. However, the weight of the pigs was intermediate between the weights of the purebreds. Mortality to 28 days was less in cross-breds than in purebreds although size and growth rate were intermediate. The white color was generally, although not completely, dominant.

How far is an increased lard production through crossing possible? [trans. title], C. Kronacher and J. Kliesch (*Ztschr. Zücht.*, *Reihe B*, *Tierzücht. u. Züchtungsbiol.*, *34* (*1936*), *No. 3*, *pp. 327–333*).—Dressing percentages and fat yields of cross-bred and purebred swine are presented. The cross-breds grew faster, but the fat percentages at the same weights were higher in purebreds.

A study of the fossil horse remains from the upper Pliocene of Idaho, C. L. Gazin (*U. S. Natl. Mus. Proc.*, *83* (*1936*), *No. 2985*, *pp. 281–320*, *pls. 11*, *figs. 4*).—Detailed descriptions are given of the bones from the fossil horse remains found in southern Idaho.

An hereditary lethal for localized motor and preganglionic neurones with a resulting paralysis in the dog, C. R. Stockard (*Amer. Jour. Anat.*, *59* (*1936*), *No. 1*, *pp. 1–53*, *pls. 10*, *figs. 3*).—A study is reported of a condition in several breeds of large dogs, involving a more or less pronounced weakness in the posterior extremities resulting in faulty gait or even in inability to stand. The condition develops after a few months of age and, in many cases, the dog compensates for it by the use of other muscles. From nine cross matings of normal Great Danes and St. Bernards, 57 puppies were raised to 3 mo. of age and all but 3 or 4 exhibited the condition. Among the 66 F_2 progeny raised to 3 mo. of age, only about 20 showed symptoms of the hind leg paralysis. However, the birth to 3 mo. of age mortality was 68 percent in this group. It is suggested that the paralysis is due to a complex of three dominant genes, two of which were contributed by one of the parent breeds and one by the other.

Crosses of bloodhounds with Great Danes produced F_1s with somewhat hyperextended straight legs. A high percentage of paralysis occurred among the F_2s that survived to 3 mo. of age. No other dogs derived from many crosses have shown the same type of paralysis. Pathological aspects of the condition involving death of certain motor and preganglionic, sympathetic neurones in the lateral and anterior horns of the lumbar region of the spinal cord are discussed.

On the genetics of the spotted pattern of the guinea pig, S. Wright and H. B. Chase (*Genetics*, *21* (*1936*), *No. 6*, *pp. 758–787*, *figs. 2*).—An analysis of white spotting in the guinea pig is reported based on crosses of inbred strains. Twenty-three grades of spotting were set up, ranging from complete self to complete white. The inbred strains showed a high degree of variability as regards the spotting expressed, and the F_1 and F_2 progenies exhibiting similar distributions suggested the operation of at least four or five pairs of segregating factors to explain the differences between the inbred strains. There were postulated a major pair of alleles *S* and *s* in which there was incomplete dominance, with *s* tending toward white. By the action of modifying factors, *SS* animals may show traces of white. *Ss* animals range from self-colored up to 95 percent white, and *ss* range from self-white to only a trace of white or are perhaps self-colored. An enormous amount of nongenetic variability was found to exist. Within strains correlations between parents and offspring and litters were very low. Only 42 percent of the variance in spotting was genetic

in a stock in which no matings as close as second cousins were made. Sex differences accounted for 2 to 3 percent of the variance in the random-bred and isogenic strains, respectively. Females had more white than males. A discussion is given of the interpretations of other authors regarding spotting in the guinea pig.

The association between color and size in mice, C. V. Green (*Amer. Nat., 69 (1935), No. 725, pp. 635–638*).—In discussing the results presented by Feldman (E. S. R., 73, p. 767) on body weights of heterozygous black and homozygous brown mice, it is suggested that linkage of the *b* gene with genes for growth offers an explanation better than that based on a direct influence of the *b* gene on growth.

Multiple lethal genes in the mouse, C. V. Green (*Jour. Heredity, 27 (1936), No. 5, pp. 181, 182, fig. 1*).—An account is given of the production of a mouse heterozygous for the four dominant mutations, yellow, brachyuric, white spotting, and naked. In crossing the yellow brachyuric females with a dominant spotted naked male, there were produced 22 progeny, representing 14 of the 16 expected classes. It is evident that these lethals in the mouse are not cumulative in action, although any one in the homozygous condition is lethal. The four doses of different mutations did not cause the death of the zygote.

Grey-lethal, a new mutation in the house mouse, H. Grüneberg (*Jour. Heredity, 27 (1936), No. 3, pp. 105–109, figs. 6*).—The operation of a new lethal gene in the house mouse is described. Homozygous animals have a pure gray fur without a trace of yellow. At birth, gray-lethals are slightly underweight. The rate of growth slows during the second week and the animal dies. There is no eruption of teeth, and bone formation is abnormal. Death is not due to starvation because of inability to eat solid food, as the gray-lethals die under 42 days of age even when receiving liquid food. Histological study of the bones showed that the spongiosa, once formed, persists permanently, whereas normally the initial spicules are later destroyed.

Some linkage tests with wavy mice, H. Grüneberg (*Jour. Genet., 32 (1936), No. 1, pp. 1–3*).—Linkage tests conducted at the University College, London, showed independent segregation of the waved gene (wv_1) in mice and the factors for pinkeye dilution (p_1), nonagouti (a), brown (b), and blue dilution (d).

Linkage studies of waved coat in the house mouse, S. O. Burhoe (*Jour. Heredity, 27 (1936), No. 3, pp. 119, 120*).—Linkage tests showed waved$_1$ to be inherited independently of the genes for agouti, albinism, short ear, leaden, rodless, piebald, anemia, waltzing, dominant spotting, dwarf, and naked. It is concluded that w_1 may be considered as the marker of another chromosome.

A geneticist studies leukemia, E. C. MacDowell (*Sci. Mo., 42 (1936), No. 2, pp. 99–110, figs. 8*).—A discussion of leukemia in mice, with special reference to the relative influence of genetic and extrinsic factors in its inheritance.

Satin, a new hair mutation of the rabbit, W. E. Castle and L. W. Law (*Jour. Heredity, 27 (1936), No. 6, pp. 235–240, figs. 3*).—After presenting a chromosome map of the rabbit showing the location of 15 genes on 10 of the 22 chromosomes, a mutation, designated as satin, is described. The coat is smoother and glossier than normal, and the hairs are more slender and have a thinner cuticulum. A detailed description is given of the hair structure. The satin mutation is due to a single gene recessive to the normal. It appears to be independent of the genes for albinism and brown, angora and English, extension, furless, rex$_1$, rex$_4$, agouti, and the blood group gene H_1.

A tame-wild rabbit cross, W. K. Wilson (*Jour. Heredity, 27 (1936), No. 3, pp. 127–131*).—In an attempt to produce a homozygous strain of agouti rabbits

of a sturdy type with dense fur, two wild bucks were crossed with three Sitka (Black Beverin) does. Considerable difficulty was experienced in making the original cross, and the mortality was heavy and litter size small in the F_1, F_2, and F_3 generations. The contrasting characteristics of size and temperament in the parents were essentially intermediate in the progeny. The wild characteristic was evident in F_1s, and no truly docile animals appeared. A wide banding condition on the agouti hair resulting in a pale color was observed in the F_2 population. This seemed to behave as a Mendelian recessive to normal agouti banding.

Some observations upon the mitotic and meiotic divisions in the Wistar rat, I, II, W. Bryden (*Cytologia, 6 (1935), No. 2–3, pp. 300–307, figs. 8; 7 (1936), No. 3, pp. 389–395, figs. 6*).—Two papers are presented.

I. *The effect of changes in temperature.*—The frequencies of chiasma and bivalent types observed on microscopic examination of testes removed from rats subjected to temperatures gradually dropped from 17° to 3° C. during a period of 4 hr., indicated that the mechanism of chromosome movement, chiasma formation, terminalization, etc., were affected by the treatment. However, no degeneration was noted, although the treatments were continued as long as 10 hr.

II. *Changes in temperature over localised areas.*—Temperature changes in the scrotum of rats were brought about by the application of ether and ethyl chloride or by heat, and after 8 hours' treatment the testicles were fixed and studied. Chiasma formation in the testicles subjected to higher, lower, or alternating temperatures and the controls did not show significant differences. Differences in the coefficients of terminalization and the frequency of the stages of meiosis are discussed.

The frillback pigeon, H. Wexelsen (*Jour. Heredity, 27 (1936), No. 4, pp. 161–163, figs. 3*).—In a study of the inheritance of the frillback character in pigeons, in which the feathers on the shield are curled and twisted, it was found that the character was probably dependent upon two factors, with perhaps minor modifiers influencing the degree of curling. The F_1 hybrids were intermediate although somewhat variable in the degree of twisting of the feathers. Backcross progeny to the frillbacks and the normal smooth pigeons were also variable. An intermediate form designated as ruffled also appeared.

[Studies of the physiology of reproduction in animals] ([New York] *Cornell Sta. Rpt. 1936, pp. 89, 90, 133, 134*).—Brief results are given as to the use of hormones in combating sterility in dairy cattle, by S. A. Asdell, S. E. Smith, and M. G. Fincher; the use of pituitrin for hastening birth and lowering the percentage of still-born pigs, by Asdell and J. P. Willman; selection for lowered mortality in White Leghorn fowls, by F. B. Hutt, G. O. Hall, and E. L. Brunett; studies of the influence of progynon B, parathormone, and the thyrotropic hormone and combinations of hormones on the blood calcium of pullets, and the glycine content of chondrodystrophy and normal fowl embryos, both by Hutt and A. R. Patton; and progress on studies of the inheritance and linkage relations of various characters in the fowl, by Hutt.

Participation of ovarian factors other than "estrin" in the estrus phenomenon, S. C. Freed, T. Garvin, and S. Soskin (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 409–414*).—The daily administration of 25 international units of dihydroxyestrin benzoate to normal and castrated adult female rats for 4, 20, 30, and 60 days before sacrificing them showed, from careful examination, that the uteri of the castrated females showed a typical oestrous reaction whereas the normals were in various stages of dioestrum.

After 20 days the ovaries of the normal animals had undergone considerable hypertrophy, and after 30 and 60 days the uteri were hypertrophied. As three principal differences were noted in the response of normal and castrated animals to oestrin administration, it is considered that the ovaries elaborate a factor concerned in the inhibition of the uterine response, rythmic activity of the endometrium, and augmentation of the uterine response to oestrin. Evidently oestrin alone cannot completely replace the ovary in inducing the uterine response.

Experiments in the physiology of mammary development and lactation, S. A. Asdell, H. J. Brooks, G. W. Salisbury, and H. R. Seidenstein ([*New York*] *Cornell Sta. Mem. 198 (1936), pp. 32, figs. 5*).—Results are reported of the effects of the administration of acid and alkaline extracts of fresh and dried sheep pituitaries and the presence of corpora lutea on mammary gland growth and milk secretion in normal and ovariectomized rabbits. Evidently the growth and secretion effects were due to different hormones. Alkaline extracts of the anterior pituitaries caused growth in the mammary gland and milk secretion. Acid extracts had no effect on mammary growth but caused lactation in the dry developed gland within four days. Mammary gland development was associated with the presence of corpora lutea in the ovary, and could be produced by sterile matings, injections of anterior pituitary extract, or human pregnancy urine. As the mammary gland and uterine development could be induced in ovariectomized and hypophysectomized rabbits injected with oestrin and progestin, it is considered that the ovarian hormones act directly and not through the hypophysis. Phyone, the gonad-stimulating hormones, and pituitrin were without effect on the mammary glands. Theelin injected during pseudopregnancy carried mammary gland development no further than usual.

Studies of milk secretion in a few goats showed that injections of prolactin caused milk secretion and when injected late in lactation caused increased milk yield. From the experiments with goats, it is concluded that the mammary development is under the influence of the ovary and that normal decline in lactation is due to the senility of the mammary gland, but that rapid decline is due to the production of insufficient prolactin by the animal and could be rectified experimentally with good results.

Sex-modification in the chick embryo resulting from injections of male and female hormones, B. H. Willier, T. F. Gallagher, and F. C. Koch (*Natl. Acad. Sci. Proc., 21 (1935), No. 11, pp. 625–631, figs. 4*).—The effect of the male and female sex hormones on the development of the gonads and other sex organs in the chick during incubation were studied. The hormones were administered in doses of 0.1 cc into the egg albumen after 24 hr. incubation.

Theelin and theelol in the zygotically determined males produced a smaller testis than normal with the flattened form of the left ovary. The gonad thus contained both ovarian and testicular tissues. In females small doses affected the oviducts slightly, whereas large doses caused them to become much swollen. Injections of bull testis hormone produced no observable effects upon the form, size, and histology of the gonads of either sex. Human male urine injections resulted in the formation of a variable amount of cortex on the left testis and the gonad assumed a flattened form. The right testis, or ovary, was unaffected. The asymmetrical differences in the response indicated that the sex hormones do not originate a morphological component but merely activate one already normally present. The degree of intersexuality produced in males appeared roughly proportional to the quantity of female hormone injected. Evidently the male and female hormones stimulate, respectively, Wolffian and Müllerian sex ducts and are, therefore, sex specific. The differences in the

response from bull testis hormone and human male urine extracts were not fully understood.

Testicular hormones and Sebright plumage, C. H. DANFORTH (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1474–1476*).—In a study of hen feathering in the Sebright bantam, three 5½-month-old cockerels were selected. One testicle was removed from one and later part of the other testicle, and both testicles were removed from another. The partially castrated bird finally became cock-feathered, while the capon showed capon feathering. This suggested that the type of feathering of Sebrights is controlled by the amount of testicular tissue present. Grafting bits of Sebright testes on the breast of a Sebright capon caused the development of cock feathering but later injections of beef testes and rat gonadotropic hormone produced hen-feathered plumage. Evidently the extracts from the bull testes and the rat augmented the action of the hormones of the cock-feathered male.

The concentration of gonad-stimulating hormone in blood serum and of oestrin in the urine throughout pregnancy in the mare, H. H. COLE and F. J. SAUNDERS (*Endocrinology, 19 (1935), No. 2, pp. 199–208, figs. 2*).—Studies were made at the California Experiment Station of the gonad-stimulating hormone in the blood and the oestrin present in the urine of four pregnant mares. When the gonad-stimulating hormone was first recognized in the blood as 390 rat units per liter at about 45 days, the amount increased very rapidly to about 50,000 rat units at 55 to 57 days and remained high for a period of nearly 50 days, after which it dropped rapidly.

A method of assay of the gonad-stimulating hormone interpreted directly from the weights of the ovaries of eight rats which receive a single subcutaneous dose on the twenty-fifth day of age with autopsy 120 hrs. later is suggested. However, the dose of the hormone must be less than 16 rat units.

Oestrin appeared in the mare's urine at about the one hundredth day of pregnancy and increased to the two hundredth and two hundred seventy-fifth day. Subsequently the concentration gradually dropped until the end of the gestation period. After parturition, oestrin could no longer be detected in the urine.

Two gonadotropic substances in mare serum, F. J. SAUNDERS and H. H. COLE (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1476–1478*).—Several experiments at the California Experiment Station showed that pregnant mare serum contains two gonadotropic substances. One was destroyed by incubation after treatment with H_2S and the other was salted out with Na_2SO_4. The first was a luteinizing hormone similar to that occurring in the pituitary, but the other, while giving some follicle-stimulating response, did not give a clear response.

Quantitative studies on the response of the capon's comb to androsterone, A. W. GREENWOOD, J. S. S. BLYTH, and R. K. CALLOW (*Biochem. Jour., 29 (1935), No. 6, pp. 1400–1413, figs. 6*).—Study was made of the influence of different conditions on comb growth in capons in response to the administration of five daily doses of androsterone. The comb response, measured as length-plus-height increase, was directly proportioned to the logarithm of the dose between the limits of 0.5 and 8 mg. Age and method of administration (subcutaneously or intramuscularly) were not important factors in causing variable results.

Growth and maintenance of the fowl's comb by administration of androsterone, R. K. CALLOW and A. S. PARKES (*Biochem. Jour., 29 (1935), No. 6, pp. 1414–1423, pl. 1, figs. 6*).—The administration of doses of 0.5 to 5 mg of androsterone per day to capons was found to induce comb growth above normal, and crowing and treading occurred. The normal comb condition

could be maintained by doses of 1 mg per day, but the hormone was not able to maintain the vas deferens as adequately. Comparative comb response showed capons to be more sensitive to androsterone than hens, and Leghorns were more sensitive than Plymouth Rocks.

Effect of androsterone and of male hormone concentrates on the accessory reproductive organs of castrated rats, mice, and guinea-pigs, R. K. Callow and R. Deanesly (*Biochem. Jour., 29 (1935), No. 6, pp. 1424–1445, figs. 9*).—In a study of the effectiveness of androsterone in maintaining normal size in prostate and seminal vesicles of rodents, it was found that 1 mg daily maintained the normal growth and structure in the prostate of 15 castrated rats, but 2 mg were required to maintain normal seminal vesicles. In mice, these doses were not so effective. Comparable results were obtained with guinea pigs. Androsterone alone or in a combination with oestrone was not as effective in restoring atrophied prostates and seminal vesicles in castrated animals as was the commercial urine concentrate of the male hormone. From these results, it is concluded that certain urine concentrates of the male hormone may contain a male hormone other than androsterone.

FIELD CROPS

[Agronomic research in California] (*California Sta. [Bien.] Rpt. 1935–36, pp. 15–20 27–34, 61–65, 104, 105*).—Outstanding findings and developments and their application to agricultural problems in the State are described from the results of breeding work with barley, wheat, corn, beans, alfalfa, sourclover (*Melilotus indica*), and sugar beets; experiments with flax in the Imperial Valley; sugar beet experiments dealing with irrigation, seedbed preparation, ridge v. flat planting, rotations, fertilizers, and nutritional studies on peat soils; forage work, including range management, effects of burning the range, chemical characteristics of range plants, tests of oats and vetch mixtures for hay, and cowpeas for summer forage; and improvement of soils with soil-building or cover crops as vetch, cowpeas, hyacinth-bean, guar, sourclover, and fenugreek. Weed control research considered methods of studying chemical weed killers, effects of soil texture on arsenic toxicity, factors affecting toxicity of chlorates and borax, the merits of carbon disulfide, sulfuric acid, and other chemicals, and control of Klamath weed (St. Johnswort) with chemicals. Certain lines of research were in cooperation with the U. S. Department of Agriculture.

[Field crops work in Hawaii], C. P. Wilsie, [E. K.] Akamine, L. D. Whitney, M. Takahashi, F. A. I. Bowers, J. C. Ripperton, and D. W. Edwards (*Hawaii Sta. Rpt. 1936, pp. 8, 11, 18–25, 40–42, figs. 2*).—Progress results are reported on briefly from breeding work and fertility and cytological studies with sweetpotatoes; variety trials with cassava, edible canna, potatoes, and soybeans for seed and forage; taro varietal and classification studies and a survey of taro-producing areas; seed storage experiments; fertilizer experiments with potatoes; adaptation studies with forage grasses and legumes; and cutting tests with alfalfa and Napier grass.

[Field crops and plant breeding research in New York], J. K. Wilson, T. L. Lyon, E. W. Leland, J. A. Bizzell, R. A. Emerson, A. C. Fraser, B. McClintock, H. H. Love, E. Dorsey, F. P. Bussell, W. T. Craig, R. G. Wiggans, J. R. Livermore, O. Smith, and E. V. Hardenburg (*[New York] Cornell Sta. Rpt. 1936, pp. 74, 75, 76, 113–115, 141, 142, 144*).—Brief progress reports (E. S. R., 74, p. 771) are given from breeding work with silage corn, wheat, oats, barley, potatoes, and soybeans; cytogenetic studies with corn; genetic studies with cereals; potato experiments, including fertilizer, soil reaction, cultural, and storage

studies; a rate of planting test with field beans; a comparison of several nitrogenous fertilizers for the production of timothy hay; and experiments concerned with the longevity and growth of alfalfa as affected by frequency of cutting, soluble carbohydrates of legumes in relation to silage production, and cross-inoculation of legumes. Certain projects were in cooperation with the U. S. Department of Agriculture.

[**Field crops work in West Virginia, 1935–36**] (*West Virginia Sta. Bul. 278 (1936), pp. 13, 17–22, fig. 1*).—Progress reports are made on agronomic experiments (E. S. R., 72, p. 606) carried on at the station and substations during the biennium ended June 30, 1936, in some cases in cooperation with the U. S. Department of Agriculture, and including breeding work with winter wheat and corn, and sweetclover for tolerance to acid soil and low coumarin content; studies of inheritance of resistance to root rot in tobacco and to wilt in watermelons; cultural experiments with potatoes and barley; fertilizer and liming tests with potatoes and a number of other field crops; reduction of erosion by including cover crops in the rotations (E. S. R., 76, p. 179); and pasture investigations, comprising a survey of the State's pastures, fertilizer and liming tests, relation of soil properties to botanical composition, and a grazing experiment.

Proceedings of the Pasture and Hayland Conference, held at New York, N. Y., September 24, 1936 (*[Washington, D. C.]: Natl. Fert. Assoc., 1936, pp. 95*).—The conference held September 24, 1936, under the auspices of the American Agricultural Editors' Association and the National Fertilizer Association emphasized not only proper management and fertilization of pastures and hayland, but also the relation of grass farming to the economical production of meat and milk, as well as to the broader program of soil conservation. The following papers by workers of State experiment stations, extension services, and other agencies are included in the proceedings: Purpose of the Conference, by C. J. Brand (pp. 7–10); Roughage in an Efficient Dairy Program, by A. J. Glover (pp. 11–16); Pasture Fertilization—The Changing Viewpoint of Twenty Years, by S. B. Haskell (pp. 17–23); Hay and Pasture Problems in the Northeastern States, by J. B. Abbott (pp. 24–37); Grass Silage and Its Possibilities, by C. B. Bender (pp. 38–40) (N. J.); Servicing the Farmer, by C. L. White (pp. 41–47); Grass Farming in the South—For Profit and Soil Conservation, by H. P. Cooper (pp. 48–53) (S. C.); Further Comments on Grass Farming in the South, by R. H. Lush (pp. 54–59) (La.); Fertilizing the Hay Crops, by T. E. Odland (pp. 60–69) (R. I.); Management and Fertilization of Permanent Pastures, by R. W. Donaldson (pp. 70–84) (Mass.); Supplemental Pastures, by H. R. Cox (pp. 85–89) (N. J.); and High Spot Summary, by H. R. Smalley (pp. 90, 91).

Pasture improvement and management, W. L. Burlison, H. P. Rusk, and J. J. Pieper (*Illinois Sta. Circ. 465 (1936), pp. 50, pl. 1, figs. 20*).—Practical information is given on the establishment and management of pastures, and suitable mixtures of grasses and legumes are recommended for different purposes and situations in Illinois. Eleven grasses and seven legumes adapted to Illinois conditions are described and their uses indicated.

"Success in establishing and maintaining good pastures depends on judicious choice of plants, use of high-quality seed, adequate testing and fertilizing of the soil, a compact seedbed, care in planting, and good judgment in grazing practices."

Manual of the grasses of the West Indies, A. S. Hitchcock (*U. S. Dept. Agr., Misc. Pub. 243 (1936), pp. 439, figs. 374*).—Descriptions, usually with illustrations and indicated distributions, are given for grasses known to grow in the West Indies. The economic grasses are discussed briefly. The sub-

families of Gramineae (Poaceae), the tribes, genera, and species are described with appropriate keys, and an index is included. This manual greatly extends and revises information presented earlier (E. S. R., 39, p. 440).

The mechanism of pollination in alfalfa (Medicago sativa), R. A. Brink and D. C. Cooper (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 678–683, figs. 2*).—Pollination in alfalfa was studied at the Wisconsin Experiment Station. Under greenhouse conditions in the winter, tripping appeared to be practically indispensable to seed setting, but in the field many pods might arise from untripped flowers. The extent to which the stigmatic film acts as a block to pollination in the untripped flower is variable: its behavior probably accounts for much of the irregularity in seed formation in the field. In view of the greater reproductive capacity of hybrid v. inbred plants, the occurrence of a considerable amount of self-fertilization seemed consistent with the maintenance of much heterozygosity in alfalfa populations. Occasionally the amount of aborted pollen may be large enough to limit seed formation, although pollen abortion is not generally an important factor. Rarely pollination in the untripped flower may be prevented by an abnormal positional relationship between the stigma and anthers.

The effect of late summer and early fall cutting on crown bud formation and winterhardiness of alfalfa, V. W. Silkett, C. R. Megee, and H. C. Rather (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 53–62*).—A study of the effect of late summer and early fall cutting on the alfalfa plant was made by the Michigan Experiment Station on plats cut September 1, 15, and 30 and October 15 and 30, 1934, and from a similar set of plats in 1935.

Compared to plants not cut or cut during October, alfalfa cut in September developed fewer crown buds per plant, produced fewer stems when active growth was resumed in the spring, produced a significantly less yield of first crop of forage the next year, had roots lower in percentage of dry matter and higher in percentage moisture, and were more susceptible to winter injury as indicated by electrical conductivity determinations and severe winter killing and heaving of plants. While no consistent differences in factors studied occurred in the second crop, the total hay yield for the season from plants cut on critical September dates was significantly less than that of plants not cut on these dates. The quantity of carbon dioxide liberated from the roots of alfalfa plants which were cut and those not cut did not differ significantly. Seasonal weather conditions influenced the exact date of cutting upon which maximum injury to the plant resulted. Plants from which first and second cuttings had been removed at normal dates were cut during late October with little effect from this removal of top growth.

The lower percentages of dry matter in the roots indicated that cutting in September induced the roots to draw upon the reserves of the root to initiate new growth.

Illinois corn performance tests.—Results for 1935 and 1936, G. H. Dungan, J. R. Holbert, W. J. Mumm, J. H. Bigger, and A. L. Lang (*Illinois Sta. Buls. 427 (1936), pp. 281–340, figs. 2; 429 (1937), pp. 389–420, fig. 1*).—Corn performance tests (E. S. R., 73, p. 35), continued in 1935 on experimental fields in 7 different geographical sections of Illinois, included 46 open-pollinated varieties, 26 composite samples of open-pollinated corn, and 202 hybrids. The detailed performance of entries on each field is set forth in tables.

In all sections the hybrids demonstrated their superiority over the best open-pollinated varieties. In central and north-central Illinois the 5 best hybrids outyielded the 5 best open-pollinated varieties by 18.2 and 20.3 bu., respectively, of sound corn an acre, and in the southeastern section by 6 bu. Some of the better hybrids and open-pollinated varieties included in the regular performance

tests in 1935 were tried out also on soils of different corn-producing capacities. The greatest differences occurred on land of high productivity. In the three silage tests hybrid entries did not greatly exceed open-pollinated entries in total yield of silage, but did surpass them in the grain fraction, i. e., in feeding value. The good hybrids were also superior to open-pollinated varieties in standing ability. Yields from second-generation hybrid seed did not exceed those from adapted open-pollinated varieties and were much below yields of first-generation hybrids.

In 1936, the 234 kinds of corn tested in 21 fields included 38 open-pollinated varieties and 196 hybrids.

The best hybrids again were found superior to the best open-pollinated varieties in all sections. The 5 best hybrids in northern, north-central, central, and south-central Illinois exceeded in yield the 5 best open-pollinated varieties by 15.7 bu. of sound corn per acre, or over 46 percent. The best hybrid entries in the two silage tests surpassed open-pollinated entries in total yield of silage as well as in grain fraction, or feeding value. Some of the better hybrids, with Station Yellow Dent as a check, grown on soils varying in productivity, were again found to be favored by a good soil to a greater extent than were open-pollinated varieties.

The relation of moisture content and time of harvest to germination of immature corn, G. F. Sprague (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 472–478, figs. 2*).—Germination and moisture studies were made by the U. S. D. A. Bureau of Plant Industry, cooperating with the Missouri Experiment Station, on field-grown corn all pollinated on a single day and with 3 to 5 ears harvested at 5-day intervals starting 10 days after pollination and continuing until immediate normal germination was obtained. The moisture content necessary for germination also was determined.

Afterripening of immature corn was concurrent with the loss of moisture. Immature corn planted just after harvest was observed to exhibit great variability in time of germination. With a decrease in moisture content, the percentage of seeds germinating rose and the variability in time required for complete germination decreased. It appears that the moisture content of immature seeds must be reduced to approximately 25 percent before normal germination occurs. That corn kernels require a minimum of approximately 35 and 60 percent of moisture in whole grain and embryo, respectively, before germination can occur was indicated by data from two experiments. It is suggested that the mechanism which inhibits the normal germination of newly harvested immature corn operates in the scutellum rather than in the endosperm or pericarp.

Protein content of corn as influenced by laboratory analyses and field replication, W. H. Leonard and A. Clark (*Colorado Sta. Tech. Bul. 19 (1936), pp. 9*).—Determinations made on composite shelled samples from each replicate in the rate of planting test noted earlier (E. S. R., 73, p. 606) showed shelled grain from Golden Glow to contain more protein than that from Pride of the North. The protein content of shelled corn varied markedly from year to year, and was affected significantly by the planting rate, the thinner rates resulting in the highest protein percentage. The method of planting (hills or rows) had no effect on the amount of protein.

Plat replication gave the larger error when the standard errors due to plat replicates and due to duplicate samples for protein analysis were compared, the ratio between the two being 6.1:1. Drawing two samples for protein instead of one did not perceptibly increase the precision of the experiment. Computation of the cost ratio of plat replicate to sample repli-

cate indicated that the analysis of a duplicate sample from each plat would have been justified in producing the most economical design only if the cost per plat had been 151 times the cost per analysis.

Variability of fiber length in a relatively uniform strain of cotton, T. R. Richmond and H. J. Fulton (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 10, pp. 749–763, figs. 4*).—Fiber-sorting methods, developed through use of the McNamara-Stutts fiber sorter (E. S. R., 74, p. 190) on samples of Pima cotton (*Gossypium barbadense*) grown at Sacaton, Ariz., materially reduced the time required for making fiber arrays of cotton of the Egyptian type. The mean length was found to be highly correlated with the upper quartile length and the combing length. Differences in mean lengths from sample to sample on the plant and from plant to plant in the row were not significant. The variance on the individual seeds amounted to over 95 percent of the total variance in fiber length, the remainder being attributable to that occurring among the means of samples on the plant and of plants in the row.

Experimental culture of potatoes in mountain and plain, Morocco, 1935 [trans. title], É. Miège (*Compt. Rend. Acad. Sci.* [*Paris*], *202* (*1936*), *No. 25, pp. 2098–2101*).—The yields and vitality were much higher in the mountains than in the plains whatever the origin and method of storage of the seed.

Reclamation of potato land flooded by salt water, G. V. C. Houghland (*Amer. Potato Jour.*, *14* (*1937*), *No. 1, pp. 19–22, fig. 1*).—Studies of the soils and potato crops on areas flooded by salt water, made by the U. S. Department of Agriculture in cooperation with the Virginia Truck Experiment Station and on Long Island, N. Y., led to the conclusion that potatoes may be grown successfully on land flooded with salt water if the salt content is below 1,000 p. p. m. (0.1 percent) at time of planting and normal rainfall occurs throughout the season. Suggested reclamation methods are mentioned.

Some changes in potato fertilizer use, B. E. Brown (*Amer. Potato Jour.*, *13* (*1936*), *No. 12, pp. 327–339*).—Some of the more important changes which have taken place in the use of potato fertilizers since the beginning of the present century discussed in this paper include changes in fertilizer materials, fertilizer composition, plant food concentration of fertilizers, acid and neutral fertilizers, uncommon plant food deficiencies, and fertilizer placement.

Results from the lime experiment with potatoes for 1936, J. B. Hester (*Amer. Potato Jour.*, *13* (*1936*), *No. 12, pp. 339–342*).—In further tests (E. S. R., 74, p. 191) at the Virginia Truck Experiment Station the finely processed limes produced the greatest returns; hydrated and limestone dolomite, hydrated calcium, and oyster shell produced yield increases exceeding 56 percent; frequent light applications surpassed heavier ones made less often; and over a 5-yr. period dolomitic and calcium limes gave respective increases of 33 and 24 percent over the check.

The potato in Canada, T. F. Ritchie (*Canada Dept. Agr. Pub. 483* (*1936*), *pp. 57, figs. 29*).—Practical recommendations on potato varieties, seed preparation, cultural and field methods, and harvesting and storage practices are supplemented by information on the status of the crop in Canada; production costs; insects and their control, by A. G. Dustan; and potato diseases and control.

Rice and rice planting in the South Carolina low country, D. Doar (*Contrib. Charleston Mus.*, *8* (*1936*), *pp. 70, pls. 6, figs. 5*).—This history of rice production in South Carolina is related in chapters entitled Rice and Rice Planting in the South Carolina Low Country, by D. Doar (pp. 7–42); The Last Days of Rice Planting, by T. D. Ravenel (pp. 43–50); and The True Story of How the Madagascar Gold Seed Rice Was Introduced Into South Carolina

(pp. 51–53) and Bibliography of the Rice Industry in South Carolina (pp. 54-68), both by A. S. Salley.

The cultivated races of sorghum, J. D. SNOWDEN (*London: Adlard & Son, 1936, pp. VII+274, pls. 4, figs. [32]*).—This volume considers the botanical history of the cultivated sorghums, including nomenclature and early classification; describes characters significant in classification; and provides determinative keys to the subseries, species, and varieties. The classification adopted follows and extends that of O. Stapf. Each species is discussed with citations, synonymy, history, botanical description, varietal characteristics, distribution, and cultural and economic notes. The relationships of wild and cultivated sorghums are explained and shown diagrammatically. A classified bibliography arranged chronologically, and indexes of botanical and vernacular names and countries and regions are appended.

Growing and feeding grain sorghums, J. H. MARTIN, J. S. COLE, and A. T. SEMPLE (*U. S. Dept. Agr., Farmers' Bul. 1764 (1936), pp. II+46, figs. 33*).—Cultural and field practices and irrigation, harvesting, and threshing methods involved in growing grain sorghums are outlined; important varieties and their characteristics are described; and information is given on the importance of grain sorghums, their adaptation, uses, place in the cropping system, the requirements for and returns from growing grain sorghums, and diseases and insect pests. The sections on feeding treat of feeding value, grain sorghum silage, grinding the grain and fodder, and pasturing grain sorghums, and suggest a number of rations containing grain sorghums.

Effect of germination and seed size on sorghum stands, A. F. SWANSON and R. HUNTER (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 997–1004, figs. 2*).—The discrepancy between laboratory and field germination of the better-known sorghums and the influence of kernel size on the number of plants per acre were studied cooperatively by the Kansas Experiment Station and the U. S. Department of Agriculture.

At Hays, 1932–34, the laboratory germination of 17 varieties ranged from 89 to 98 percent, averaging 95, whereas field germination was 45, 45, and 61 percent for May 15, June 1, and June 15 plantings, averaging 50 for all dates. Germination increased considerably in June 15 plantings, due to more favorable soil temperatures. Germination was highest as a rule for sorgos and darso and lowest for certain soft-seeded grain sorghums, including feterita, Club, and hegari. Better stands usually have been obtained with the harder seeded varieties having a thin mesocarp (E. S. R., 60, p. 628) than with feterita. Since the number of kernels per pound of sorghum seed varies approximately from 12,000 to 35,000, depending on the variety and plumpness of the seed, size planting adjustments must be made to secure proper stands.

Seed of 7 varieties, taken from standing stalks in the cold and rainy fall of 1933 when seed of most sorghums were slow in maturing and drying, made low field germinations even when harvested before low temperatures approached, and only about one-half as much as when collected after freezing temperatures occurred. In 1931 with 6 varieties, high germination was obtained from soft dough seed as compared with fully ripe seed, but delayed harvest and exposure to frost and sleet greatly reduced germination. No stimulation of vegetative vigor was noted in seedlings or plants from seed treated with Coppercarb and mercurial compounds in 1927 and 1928. Feterita responded better to seed treatment in increased germination than did Red Amber sorgo and Dawn kafir.

Effect of thiourea upon proximal dominance in the sweet potato, F. HORSFALL, JR. (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 471, 472*).—Porto Rico

sweetpotato roots were soaked in distilled water solutions of 2 to 4 percent thiourea for from 1 to 2 hr. at the University of Missouri. When immersion was longer than 1 hr., a retarding effect was evident which was also true of the 4 percent solution for 1 and 2 hr. However, roots treated with 4 percent for 1 hr. later produced a good crop of sprouts well distributed over the surface. All treated roots showed a loss of proximal dominance in a second crop of slips similar to that earlier.

The influence of handling seed stock on the shrinkage, plant production, and yield of the Triumph sweet potato, W. S. Anderson and J. B. Edmond (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 466–470*).—Sweetpotatoes, in experiments at Laurel, Miss., were dug December 5, 1934, cured in crates December 8–24, stored from December 24 to March 15, 1935, bedded March 30, and plants pulled and transplanted to field plats from April 29 to August 2, and the crop harvested October 9. Roots "carefully handled", i. e., placed directly from the row into crates lined with cotton outing cloth, lost less weight in storage, had smaller percentage of storage rots, and were more efficient plant producers than roots "commercially handled", i. e., thrown into unlined crates. The handling of the seed stock apparently had slight influence on the yielding ability of the transplant.

Curing and storing sweet potatoes without artificial heat, W. D. Kimbrough (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 456–459*).—Keeping of sweetpotatoes in storage, according to results at the Louisiana Experiment Station, has differed little as to amount of shrinkage or rot whether or not artificial heat has been provided. In the Sunset district large quantities of sweetpotatoes have been stored in buildings similar to warehouses, and the roots themselves seem to provide enough warmth during cold spells to obviate artificial heating during storage. Most of the crop is dug in October, which is comparatively warm and usually dry.

Varietal studies of flue-cured, burley, and dark tobaccos, N. A. MacRae and R. J. Haslam (*Canada Dept. Agr. Bul. 178 n. ser. (1935), pp. 61, figs. 7*).—Tobacco varieties collected from tobacco districts in Canada and the United States are described as to field growth measurements, growing plant and green leaf, relative maturity, yields, sorting and grading, and price and grade index. The 59 varieties and strains of flue-cured are classified into 9 groups; the 36 sorts of Burley into 7 groups; and the 31 kinds of dark tobacco into 5 groups.

Harrow Velvet, a new variety derived from a strain of White Burley resulting from a cross made by W. D. Valleau of the Kentucky Experiment Station, is described as early and consistently resistant to black root rot and having other good characteristics.

Rate of water loss in wheat varieties and resistance to artificial drouth, B. B. Bayles, J. W. Taylor, and A. T. Bartel (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 40–52, figs. 3*).—Eight varieties of spring wheat with about the same relative time of maturity were grown in greenhouses at the Arlington, Va., Experiment Farm. Two plants each of two varieties were grown in an 8-in. pot, each variety being paired with each other variety to compensate for soil moisture variations.

When some pots were placed on a revolving table in a current of hot air, from 92° to 98° F., differences in amount of injury between such varieties as Baart and Hope were demonstrated clearly, but smaller differences between other wheats were not so evident. In order of increasing injury the ranking was Onas, Baart, Kubanka, Huston, Ceres, Marquis, Hope-Ceres, and Hope. The rates of water loss from cut plants dried at room temperatures were determined by weighing at intervals. When grown with normal soil moisture

the ranking with respect to decreasing rates of water loss was Kubanka, Baart, Onas, Ceres, Marquis, Huston, Hope, and Hope-Ceres. When the plants were subjected to low soil moisture, considerable variability was found between pots. Evaluation of the varieties from both tests was consistent with field performance under drought conditions.

Based on average results for 1934 and 1935, secured in the field at Tucson in cooperation with the Arizona Experiment Station, varietal ranking as to decreasing resistance to water loss was Kubanka, Baart, Ceres, Onas, Marquis, Huston, Hope-Ceres, and Hope, an order corresponding closely with that established by greenhouse-grown material. Results from the same wheats grown at Pullman, Wash., and Moro, Oreg., did not conform so closely to this order.

Proceedings of the Association of Official Seed Analysts of North America, 1936 (*Assoc. Off. Seed Anal. North Amer. Proc., 28 (1936), pp. 115, figs. 11*).—The activities of the association during the year ended June 1936 are reported with an account of the twenty-eighth annual meeting at Rochester and Geneva, N. Y., June 16–19, 1936. The following papers by State experiment station and U. S. Department of Agriculture workers and those from other agencies are included: History of Association of Official Seed Analysts, by A. M. Lute (pp. 27–30) (Colo.); The Other Fellow's Viewpoint (pp. 32–36) and Weight Per Bushel of Wheat in Relation to Its Seed Value (pp. 59–61), both by W. O. Whitcomb, and Further Studies With the Germination of Crested Wheat Grass, by W. D. Hay (pp. 86–88) (all Mont.); Should Our Association Be Interested in the Two Purity Analysis Methods of the International Seed Testing Rules? (pp. 42, 43), Toxic Effect of Certain Seed Treatments as Revealed in Germination Response (p. 92), and The Better Seed Program of New York State (pp. 112–114), all by M. T. Munn, A Preliminary Report on the Germination of Mustard Seed (pp. 74–76) and The Germination of Lettuce Seed in the Laboratory and in the Field (pp. 80–83), both by A. L. Shuck, Procedure Used in an Analytical and Mycological Study of Seed Wheat (pp. 89–91) and Prevalence and Significance of Fungous Associates of Pea Seeds (pp. 101–107), both by W. F. Crosier, and Some Observations on the Decline in Viability of Chewing's Fescue Seed (*Festuca rubra commutata*), by S. R. Patrick (pp. 76–79) (all N. Y. State); "Non-Warranty" or Disclaimer Clause, by M. H. Snyder (pp. 44–46) (W. Va.); Seed Inspection in Canada, by W. J. W. Lennox (pp. 46–52) (Ont.); Seed Inspection in New York State, by J. C. Stephens (pp. 53, 54) (N. Y.); The Interstate Clause of the Federal Seed Act to Date, by W. A. Davidson (pp. 54–57), and Growing Tests in an Attempt to Differentiate *Melilotus alba* and *Melilotus officinalis* on Seed Characteristics, by F. M. Torpy and E. F. Sirrine (p. 58) (both U. S. D. A.); Comparative Absorption of Water by Endosperm and Embryo of Corn Kernels, by G. N. Davis and R. H. Porter (pp. 62–67), Germination of Injured Weed and Crop Seeds, by R. H. Porter and K. Koos (pp. 68–73), Special Equipment for Germinating Corn and Soy Beans, by R. H. Porter, G. N. Davis, and E. L. Erickson (pp. 83–86), and Relation of Seed Disinfectants to Seed Analysis, by R. H. Porter (pp. 93–101) (all Iowa); and Pathogenic Associates of Tomato Seed: Their Prevalence, Relation to Field Disease, and Elimination, by J. H. Miller (Univ. of Ga.) and W. F. Crosier (N. Y. State) (pp. 108–111).

Eradication of bindweed in bluegrass lawns, R. C. Kinch and F. D. Keim (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 30–39*).—Complete eradication of bindweed in a lawn at the Nebraska Experiment Station by pulling the plants at weekly intervals required one season and a half and a total of 28 treatments, and with pulling at 2-week intervals required two entire seasons and a total of 20 treatments. Pulling at 3- and 4-week intervals for 2 yr.

failed to eradicate the weed. Cost of eradication by pulling averaged from $1.25 to $1.50 per square rod.

Light sprayings on individual bindweed plants with sodium chlorate solutions of 0.5, 1, and 2 lb. per gallon at 2-week intervals gave complete eradication with very little difference in the effects of the three concentrations. Grass areas from 2 to 4 in. in diameter were killed by repeated sprayings of one place where bindweed plants kept coming up. Individual treatment of bindweed plants with 5 g of sodium chlorate gave complete eradication in one season, and when the lawn was watered thoroughly after application the bluegrass was injured very little. Broadcasting sodium chlorate and immediately leaching it in the soil by applying water killed bindweed in a year and left the bluegrass relatively uninjured. A total of 5 lb. of sodium chlorate in 1-lb. applications at 2-week intervals gave best results. The toxic action of sodium chlorate on bluegrass was controlled by watering.

Field bindweed and control methods for South Dakota, C. J. FRANZKE and A. N. HUME (*South Dakota Sta. Bul. 305 (1936), pp. 51, figs. 25*).—Experiments in the eradication of field bindweed (*Convolvulus arvensis*) by fallowing, paper mulch, application of chlorates and other chemicals, and by the use of smother crops, carried on at the station and substations, are reviewed in detail, and characteristics of the weed and its effects on crop production are described. The control method promising to be most effective, according to results obtained, provides for the introduction into the crop rotation of summer fallow followed by a smother crop of winter rye, with repetition for at least two consecutive seasons and probably three in most cases. Thirty-one references are appended.

Rootsprouts as a means of vegetative reproduction in Opuntia polyacantha, A. D. HARVEY (*Jour. Amer. Soc. Agron., 28 (1936), No. 9, pp. 767, 768, figs. 3*).—The heavy invasion of *O. polyacantha* on range pastures of eastern Colorado, where it often composes as much as 40 percent of the vegetative cover, is accelerated greatly by the root sprout method of reproduction. The two definite types of roots disclosed were a comparatively small lateral root, rather succulent and with numerous ramifications, and a larger main lateral, woody in nature and not so extensively ramified. The main laterals which separate from the parent plant run to varied lengths close to the soil surface of the ground. From the main laterals and its subdivisions young plants are borne which show the initial development from minute areolae with a compact cluster of fine glochines.

HORTICULTURE

The relation of growth-substances, or hormones, to horticultural practice: A review, M. A. H. TINCKER (*Jour. Roy. Hort. Soc., 61 (1936), No. 9, pp. 380–388, pls. 5*).—This is a concise, clear statement of the background and present status of the subject.

Some relationships of cultural systems to soil organic matter, L. HAVIS and J. H. GOURLEY (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 99–102, fig. 1*).—Determinations by the Ohio Experiment Station of the organic matter in soils of plats at Marietta, where cultural and fertilizer experiments have been in progress for several years, showed some accumulation of humus. On the plat which over a period of 21 yr. received a total of 328 tons of manure per acre plus cover crops and crop residues, the soil contained 2.73 percent of organic matter as compared with 2.11 percent for the control. It is pointed out that the control plat probably had lost some of its original organic

material. The authors state that the results fail to show that large applications of organic matter necessarily mean large increments of humus.

A subirrigation method of supplying nutrient solutions to plants growing under commercial and experimental conditions, R. B. WITHROW and J. P. BIEBEL (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 9*, *pp. 693-701*, *figs. 3*).—From the Indiana Experiment Station, "a subirrigation method of supplying nutrient solutions to plants growing in sand culture which lends itself to large-scale production is described. It consists in principle of pumping nutrients from a submerged reservoir into the bottom of a shallow bed of fine gravel or cinders with a centrifugal pump. The pump is controlled by an electric time switch which stops the operation when the bench is flooded. The solution then flows back into the tank through the pump by gravity.

"Modifications of the method are discussed for use in experimental set-ups on a small scale. . . .

"The advantages of the system are (1) frequent and complete flushing of the roots with air and nutrient solution, (2) economy of nutrients, since the solution drains back into the tank again, and (3) completely automatic operation over long periods of time."

Leaf injection, W. A. ROACH (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt.*, *23* (*1935*), *pp. 134-136*, *figs. 2*).—The cut tips of chlorotic leaves on a small pot-grown pear tree were immersed in 0.1 percent solutions of zinc sulfate, manganese sulfate, iron tartrate, and copper sulfate. After 18 hr., the veins of the copper-treated leaf had turned brown with brown spots on the leaf. When the copper sulfate was reduced to 0.05 percent, the injury after 24 hr. was confined to a browning of the cut edges. None of the chemicals, except copper sulfate, had any harmful effect after five days' injection, but iron tartrate was the only beneficial substance for restoring the normal green color. The entire tree was restored to a normal green by injecting iron tartrate into the trunk.

Tree injection, 1935 experiments.—A progress report, J. HEARMAN, B. F. GOODMAN LEVY, and W. A. ROACH (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt.*, *23* (*1935*), *pp. 137-141*, *figs. 4*).—The earlier conclusion, namely, that leaf damage from too strong concentrations of injected chemical nutrients will become apparent within a few hours and always within a day after injection is completed, was not sustained in 1935 when a severe spring freeze occurred about the middle of May. Damage was not evident until three days after injection and was idfferent in symptoms from that of 1934. Apparently due to the freeze, the leaves continued in an immature condition after unfolding.

Evidence as to how freezing kills plant tissue W. H. CHANDLER and A. C. HILDRETH (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 27-35*, *fig. 1*).—Using as material the pollen of four plants, Lukens Honey peach, Himalaya blackberry, a variety of amaryllis, and the yellow snapdragon, the authors found that pollen frozen as it comes from the anthers kept better at −15° to −17° C. than at room temperature. Pollen covered with freezing water and held at −15° to −17° was nearly all killed in 20 min. Fresh pollen coated with castor oil or with Wesson oil was uninjured by the ice when held in distilled water at −15° to −17°. Pollen held at the same temperatures in strong solutions of sucrose or of dextrose was not injured until the water and sugar were crystallized rather firmly. At the same temperatures, pollen placed in concentrated peach bark sap suffered much less injury than comparable pollen in ice of distilled water. At room temperatures, the sap killed practically all the pollen in a short time. From the results and from a general study of the entire problem, the authors are inclined to accept the Maximow theory that

killing of protoplasm at low temperatures is due to direct effects of the ice masses rather than a concentration or the changing of the sap caused by freezing out of the water.

[Horticultural investigations by the California Station] (*California Sta. [Bien.] Rpt. 1935–36, pp. 20–23, 34–53, 102–104, 105–108, 126, 127*).—General comments are presented on the results of studies on citrus fertilization; the relation between soil nutrients and citrus composition; fertilization of the Persian walnut; composition of date fruits; development of disease-resistant vegetables including cantaloups, watermelons, and tomatoes; breeding of marketable size watermelons; development of thrips-resistant onions; improvement of the carrot; structure of celery fibers or strings; breeding of new walnut and citrus varieties; rootstock effects in citrus; rootstocks for deciduous fruit trees; nematode-resistant rootstocks; oak-root-fungus-resistant stocks; pollination of cherries and pears; breeding of new fruits; blight-resistant stocks of pears; grape rootstocks resistant to phylloxera and nematodes; inheritance of color, disease resistance, and flower type in garden flowers; irrigation requirements of deciduous fruit trees, grapes, tomatoes, oranges, and lemons; fertilization of deciduous fruits; nature of bleeding in the grapevine; and on the precooling of pears and asparagus prior to long distance shipments.

[Horticultural investigations by the Hawaii Station], J. H. BEAUMONT, C. P. WILSIE, M. TAKAHASHI, [W. W.] JONES, W. B. STOREY, R. H. MOLTZAU, [J. E.] WELCH, J. C. THOMPSON, J. C. RIPPERTON, D. W. EDWARDS, [E. T.] WATANABE, and R. K. PAHAU (*Hawaii Sta. Rpt. 1936, pp. 8–10, 24, 25–33, 42, 44–50, 93–95, figs. 4*).—There is presented in this annual report of progress information on the following studies: Breeding of lettuce; testing of tomato and sweet corn varieties; introduction of litchi, macadamia nuts, and other plants; selection of improved strains of papaya; fixation of flower type in the papaya; selective breeding and propagation of litchi and lungan; chromosome numbers in species of *Passiflora*, *Eugenia*, and other plants; variety testing and propagation of the avocado, mango, and other tropical species; introduction of new forms of citrus; improvement of the macadamia nut by selection and top-working; propagation of the macadamia nut; variety tests of truck crops; nitrogen requirements of the tomato; fertilizer requirements of vegetables and coffee; control of dieback of coffee by pruning and fertilization; effect of fertilizers on the chemical composition of coffee berries; and the grading, curing, and cracking of macadamia nuts.

[Horticultural investigations by the West Virginia Station] (*West Virginia Sta. Bul. 278 (1936), pp. 5, 6, 10–13*).—Among studies discussed are those dealing with the chemical nature of the pigment forming the red color in the skins of Winesap apples; the effect of ethylene, ethylene chlorohydrin, and ultraviolet irradiation on stored apples; value of nitrogen gas as a preservative for black walnut kernels; comparative number of pollen grains produced by different apple varieties; effect of sudden temperature drops on the viability of peach flower buds; nature of winter injury to apple fruit buds; the testing of apple and cherry rootstocks; depth of penetration of apple roots; methods of training young apple trees; variety testing of fruits; the nature of cracking in Stayman Winesap apples; and rotations for vegetables.

[Olericultural investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 115, 139–141, 142–144, 145*).—Included are brief reports on the progress of the following studies: Cabbage breeding by C. H. Myers; fertilizer requirements of vegetable crops grown on Long Island, by P. H. Wessels and J. D. Hartman; fertilizers and manures for asparagus, by Wessels and H. C. Thompson; soil reaction for vegetable crops, by Wessels, H. S. Cunning-

ham, and Hartman; the handling and storage of vegetables, by H. Platenius, J. E. Knott, and Hartman; variety and strain tests of vegetables, by P. Work and E. V. Hardenburg; lettuce improvement, by Knott; and color development in tomatoes, by O. Smith.

The culture of truck crops for exportation [trans. title], L. A. Serrano, C. Esteva, Jr., and A. Riollano (*Puerto Rico Col. Sta. Circ. 105 (1936), Span. ed., pp. 56, figs. 23*).—Prefacing the paper with statistical information on the present status of the industry, the authors present information on growing and preparation for shipment of cucumbers, peppers, and tomatoes.

The influence of commercial fertilizers, potassium iodide, and soil acidity on the iodine content of certain vegetables, W. B. Mack and E. P. Brasher (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 10, pp. 789–800, fig. 1*).—In studies conducted by the Pennsylvania Experiment Station, no relation was observed between the iodine content of potatoes, tomatoes, and sweet corn and the fertilizer treatment, soil acidity, or yield. An application of potassium iodide at the rate of 2.356 kg per acre, equivalent to approximately 2 mg of iodine to each kilogram of soil in the upper 6 in., increased the iodine content of green beans considerably but injured the plants and reduced yields. Similar applications to turnips increased yields somewhat and increased the iodine content 10- to 120-fold. The maximum increase in iodine content occurred on plats rendered alkaline by hydrated lime and the minimum on plats acidified with sulfur or unmodified in acidity. The maximum recovery of applied iodine by turnips was 11.4 percent. Analyses of turnips grown the next year without further iodine application indicated that there is no residual effect. *In general, the iodine content of turnips from soil not fertilized with potassium iodide increased with the acidity of the soil. Under the same conditions, the iodine content of beans was little affected.*

Early tomatoes, *W. T. Tapley (Farm Res. [New York State Sta.], 3 (1937), No. 2, p. 4).—Brief descriptive notes are presented on a large number of early maturing varieties of tomatoes tested at the station.*

[**Pomological investigations by the Cornell Station**] ([*New York*] *Cornell Sta. Rpt. 1936, pp. 126–129*).—Progress statements are presented on soil factors associated with significant difference in yield behavior of important fruit crops, by J. Oskamp, A. J. Heinicke, and D. Boynton; effect of careless handling on the keeping quality of apples, and effect of washing for spray-residue removal on bruising and on storage quality of apples, both by E. L. Overholser and M. B. Hoffman; the best distribution for pollinizer trees in the orchard to give satisfactory set of fruit on McIntosh, by L. H. MacDaniels; effect on the set of fruit of spraying and dusting apple blossoms with various fungicides and bactericides, by MacDaniels and E. M. Hildebrand; an anatomical study of fruit trees injured by low temperatures during the winter of 1933–34 (with the purpose of correlating the nature and amount of the injury with the recovery of the tree), inarching and bridge grafting as a means of saving trees with crowns wholly or partly girdled by winter injury or other agents, and propagation of superior native nut varieties, all by MacDaniels; influence of age and condition of trees on their response to pruning and response of young fruit trees to annual pruning as compared with pruning repeated at intervals of two years or longer, both by Heinicke and MacDaniels; influence of time of harvest on the keeping quality of Cortland and McIntosh apples, by Heinicke and E. F. Savage; the photosynthetic efficiency of apple foliage under natural conditions, by Heinicke and N. F. Childers; root growth in apple trees, by Heinicke; and influence of food manufactured by leaves of the Northern Spy apple on the fruit characters of the McIntosh apple, by Heinicke.

The effect of orchard plants on subsoil moisture, C. C. WIGGANS (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 103–107, fig. 1*).—Examinations by the Nebraska Experiment Station of soil samples collected at various depths in the vicinity of 17-year-old apple trees spaced 30 by 33 ft. with filler present in part of the orchard showed that 85 percent of all the available moisture from the fifth to the thirtieth foot had been exhausted by the trees in the filler section. In the absence of fillers, the trees had used approximately 65 percent of the available moisture. In a second study in which samples were taken 1.5, 15, and 22.3 ft. from the trunk, it was found that the depletion was greater nearer the trunks. Observations of samples collected beneath grapes which had been mulched continuously for 10 yr. or more and beneath clean cultured vines showed that mulching is very effective in conserving moisture. Observations on soil moisture in a white pine forest following the death of the trees from drought and a year later after a seasonal rainfall of 30 in. showed a great improvement in soil moisture conditions.

Some problems in the use of superior rootstocks for fruit trees, J. A. McCLINTOCK (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 329–331*).—Investigations by the Indiana Experiment Station at La Fayette and Mitchell show that various varieties of apples after becoming established on their own roots are superior to the same varieties on French Crab. Virginia Crab was found fairly resistant to woolly aphis under Indiana conditions. Grimes Golden on own-rooted Virginia Crab suffered no mortality from collar rot. The method of top-working young apple trees is discussed.

What yield of rooted shoots may be expected from mother plantations of Malling apple and quince rootstocks? H. B. TUKEY and K. D. BRASE (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 338–345, figs. 3*).—In studies at the New York State Experiment Station in which various Malling rootstocks were propagated by mound and trench layering according to their inherent vigor, it was found that under good cultural conditions Malling apple and quince rootstocks may be expected to yield sufficient new plants to make their propagation commercially feasible. The number of rooted shoots obtained per unit area increased for several years after the establishment of the beds, but the percentage of well-rooted salable shoots varied from year to year with the growing conditions. Quince rooted more readily than apple, Malling I and IX rooted easily, II rooted well, followed in descending order by XIII, XII, and XVI. The apples were not injured appreciably by extreme low winter temperatures, but quince, from which salable shoots were removed in the fall, suffered severe damage.

The Malling clonal stocks in relation to McIntosh and Wealthy, J. K. SHAW (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 346–349*).—In 1924 the Massachusetts Experiment Station imported many of the Malling stocks, and after budding them to McIntosh and Wealthy planted the trees in orchard form in 1928 with seedling-rooted and own-rooted trees as checks. Records on the orchard showed that production was correlated with tree size, and only I and IV, when grafted to McIntosh, tended to promote early bearing. Wealthy was more variable on seedlings than on any clon, but McIntosh was less variable only on XVI. There was some suggestion that McIntosh on certain clons may hold its fruit better near harvest time. In some cases, the stocks seemed to influence the shape of the apples. On a basis of productivity, Malling XII and possibly XVI were better than seedlings or own roots for both Wealthy and McIntosh.

Studies in incompatibility of stock and scion.—I, Information accumulated during twenty years of testing fruit tree rootstocks with various scion varieties at East Malling, J. AMOS, T. N. HOBLYN, R. J. GARNER, and

A. W. WITT (*East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 81–99, fig. 1*).—The anatomical examination of pieces of root collected from 8- to 10-year-old apple trees revealed a striking difference in the size of the vessels in Malling IX roots and in those developed from the scion. Rootstocks grafted with scions, of which the root structure was very different, appeared to maintain their original structure. An examination of Malling IX rootstocks from trees grown in different soils failed to show that the soil variation had exerted any significant influence on the structure of the root.

A note on the moisture content of the stems of different rootstocks, M. C. VYVYAN (*East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 131–133*).—Repeated measurements of the moisture content in the stock stem below the bud union in eight kinds of trees developed by grafting Cox Orange Pippin and Lane Prince Albert apple scions on four Malling stocks, Nos. I, II, IX, and XII, showed in every case the least moisture in stock No. II. In most cases the differences were significantly different. The author suggests that the low moisture values in stock No. II may be associated with low conductivity, as reported by Knight (E. S. R., 57, p. 138).

The root systems of some three-year-old trees of Lane's Prince Albert on two selected rootstocks (Malling No. II × Northern Spy), H. M. TYDEMAN (*East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 107–110, figs. 2*).—Comparative measurements of weights of top and roots of 138 3-year-old trees of Lane Prince Albert propagated on two seedling clons derived from crossing Malling II × Northern Spy showed the root systems of the two clons to be widely different despite the common parentage. The trees on both root types were slightly larger than trees on Malling II and decidedly less vigorous than trees on Malling XII. The differences between the two clons are conceded to be apparently of genetic character.

A comparison of the top and root growth made by five varieties of apples on seedling and scion roots during five years in the orchard, F. S. LAGASSÉ (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 366–371*).—Presenting further information (E. S. R., 72, p. 479) on a rootstock experiment established by the Delaware Experiment Station in 1929, the author states that in general the varieties Yellow Transparent, Stayman Winesap, Delicious, Grimes Golden, and Rome Beauty in their first five years in the orchard made a greater net growth of roots and tops on seedlings than on their own roots. Marked differences between varieties, irrespective of the type of root, indicated that the scion controlled largely the amount of growth. At the end of five years, the variability of the net growth made by the scion-rooted trees was less than that of seedling-rooted trees in four of the five varieties, but not significantly so. The top/root ratio of the seedling trees was generally less than that of the scion-rooted trees. In general, tops weighed about twice that of roots.

Crotch angles as affected by the method of training young apple trees, L. P. BATJER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 36–38*).—In experiments at Kearneysville, W. Va., three types of training—heading at 30 in., group disbudding, and single disbudding—were compared on vigorous 1-year-old Rome Beauty, Delicious, and Stayman Winesap trees planted in the spring of 1931. In the spring of 1935, crotch angles were measured on 3 or 4 limbs of each tree. On the basis that an angle of less than 40° with the trunk indicates a weak crotch, it was found that the second two treatments produced weak trees in Rome Beauty. The same tendency to a lesser degree was observed in Delicious. In Stayman Winesaps, all treatments gave satisfactory angles, but the same trends were again observed. The author concludes that disbudding is a suitable treatment for naturally spreading varieties such as Jonathan and Stayman Winesap, but that for upright growers a sufficient number of shoots should

be left the first season to permit a desirable selection of crotch angles. Increase in trunk growth was comparable in all three groups with no significant differences either in the first or fifth growing seasons.

Trunkless apple trees, A. F. Yeager (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 39, 40*).—Observations in 1935 in an orchard of Hibernal apples planted at the North Dakota Experiment Station in 1920 with part of the trees in standard form and part trunkless, showed 70 percent mortality in the standard trees as compared with none in the trunkless group. The surviving standards were significantly smaller and had yielded less fruit.

Apple leaf structure as related to position of the leaf upon the shoot and to type of growth, F. F. Cowart (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 145–148, figs. 3*).—Structural comparisons of leaves taken from comparable positions on vigorous spurs and shoots showed certain differences associated with position. Leaf thickness decreased from the base toward the median portion of the shoot and increased thence to the apex. In general, the palisade cells occupy a greater percentage of the mesophyll tissue as the leaves approach the apex. Stomatal frequency increased usually progressively from leaf to leaf from the base to the apex. The size of the stomata was inverse to their number. McIntosh, Cortland, Delicious, and Northern Spy had 350, 351, 411, and 448 stomata per square millimeter. Stomatal frequency varied on portions of a single leaf. As contrasted with leaves on spurs, particularly fruiting spurs, shoot leaves tended to be thicker and larger.

A comparison of three methods of measuring photosynthetic activity of apple leaves, W. F. Pickett (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 152–154*).—Continuing studies (E. S. R., 74, p. 202), the author discusses results secured by the Kansas Experiment Station in comparing three methods, (1) that of Heinicke and Hoffman, (2) determination of the organic substances formed or the dry matter accumulated by a unit of leaf in a given period, and (3) comparisons at different times of day of the total acid hydrolyzable carbohydrates for measurements of photosynthetic activity. No two methods gave the same results, principally because they do not measure the same activities. In the case of Delicious a greater gain per unit area was shown with the dry weight increment method than with the other two.

The effect of flotation sulphur spray on the CO_2 assimilation of apple leaves, E. P. Christopher (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 149–151*).—After collecting data in the orchards of the Rhode Island Experiment Station on the carbon dioxide assimilation of McIntosh apple leaves over two 4-hr. periods, half were sprayed on both surfaees with flotation sulfur paste. There was a higher assimilation by the sprayed leaves in the morning and a lower rate in the afternoon than was indicated by the unsprayed controls. On the basis of six runs twice daily for three successive days after spraying, the assimilation by the sprayed leaves was about 79 percent that of the unsprayed. In the case of small Baldwin trees growing in the greenhouse, the daily average assimilation was lower in the case of sprayed than unsprayed leaves. The average for six runs showed about 82 percent assimilation for the sprayed as compared with 100 percent for the unsprayed leaves.

To what extent is the McIntosh apple influenced by the food materials synthesized by Northern Spy leaves? A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 336, 337*).—In line with a previous study (E. S. R., 60, p. 142), McIntosh branches located on a tree which had been partially topworked with Northern Spy were defoliated soon after petal fall to one leaf per fruiting spur. One McIntosh branch was ringed near its base. Practically no bloom was produced by the Northern Spy branches although before defoliation Northern Spy foliage constituted more than 90 percent of the total. The

McIntosh apple attained a good size and high color about the same time as fruit on adjacent McIntosh trees; however, the fruits ripened much later and remained firmer for a much longer time. The McIntosh apples from the treated branches showed modifications around the calyx and stem end which strongly suggested Northern Spy, and the flavor was also suggestive of a blending between the two varieties.

Soil nitrate nitrogen determinations following the applications of calcium cyanamide and nitrate of soda to the surface of the soil under apple trees during dry and normal seasons, R. S. MARSH (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 142–144*).—In fertility experiments conducted cooperatively with 10 orchardists, the Illinois Experiment Station found from studies of soil samples collected at various dates during the year that nitrate content is higher at certain seasons in the cyanamide plats and at other times under nitrate of soda applications. The cyanamide plats were higher on October 10 and November 15, 1934, and on April 26 and November 15, 1935, whereas the nitrate of soda plats were higher in nitrates on June 13 and 26, July 20, and August 10, 1935.

The influence of mulching apple trees on the moisture-holding capacity of the topsoil, D. BOYNTON and L. P. BATJER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 92–94, fig. 1*).—Studies at the [New York] Cornell Experiment Station of the soil beneath trees that were mulched with stable manure at the rate of 0.5 ton per tree from 1924 to 1929 and 1 ton per tree from 1930 to 1934, and of soil from trees that were mulched with leguminous hay showed considerable increase in the moisture equivalent of the topsoil beneath the manured trees and beneath trees mulched for 4 yr. with legumes. There was no significant increment following 2 yr. of hay mulching. Composite samples of four borings 6 in. deep were taken beneath each tree.

The distribution of rain under an apple tree, R. L. MCMUNN (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 95–98, fig. 1*).—Measurements by the Illinois Experiment Station throughout the growing season of water collected in 20 open cans distributed beneath a 25-year-old Jonathan tree showed, during every rain, less water in the cans 4 ft. from the trunk than those farther distant. The foliage shed considerable rain as indicated by the total water collected by cans directly under the densest part of the branchs. Uneven distribution after leaf fall indicated that even the bare limbs deflect rain. The prevailing direction of the wind was an important factor in the distribution of the rain.

Metaxenia in apples, B. R. NEBEL (*Jour. Heredity, 27 (1936), No. 9, pp. 345–349, fig. 1*).—In this further report (E. S. R., 72, p. 462) the author reviews the earlier work on the subject and presents some additional information. McIntosh pollinated with Wilson Red June and Boiken yielded fruits alike in weight, seed number, and acidity of the juice, but after 9 mo. of cold storage the McIntosh × Wilson Red June fruits showed only slight internal browning and no decayed spots, whereas in the McIntosh × Boiken group 25 percent of the apples were completely decayed and all others showed considerable internal browning.

New apple varieties give much promise, G. H. HOWE (*Farm Res. [New York State Sta.], 3 (1937), No. 2, pp. 3, 9*).—This, the first of two articles on new apple varieties originated for the most part by the station discusses the characteristics of the varieties and their status at the present time. During the breeding operations at the station, there have been developed a total of 13,049 apple seedlings of which 4,569 have fruited and 81 have been given intensive trials.

Certain effects of wax treatments on various varieties of apples and pears, R. M. Smock (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 284–289, figs. 2*).—Daily determinations by the California Experiment Station, Davis, on Gravenstein and Yellow Newtown apples and Hardy, Bartlett, and Winter Nelis pears dipped in waxed emulsions and held at 67° F. showed a marked retardation in the rate of respiration in all varieties. However, when waxes were applied in sufficient quantity to retard ripening materially, the pears did not ripen normally and failed to develop full color. The flesh of the treated pears took on a noticeable alcoholic flavor. The waxed Gravenstein apples did not ripen as satisfactorily as the controls, but in the case of the Yellow Newtown waxing did not lessen quality until about the twenty-fifth day, and since this variety is consumed while still rather green in color waxing had commercial possibilities.

Studies of the intercellular gases in fruits indicated that covering pears and apples with full strength wax emulsion increased significantly the amount of carbon dioxide in the fruit. The greatest increase in the shortest length of time occurred in the Hardy pear.

Soil management systems in a young Bartlett pear orchard, F. S. Howlett (*Ohio Sta. Bul. 578 (1936), pp. 38, figs. 6*).—Of five treatments, (1) cultivation with cover crops, plowed, (2) cultivation with cover crops, disked, (3) grass and straw mulch, (4) bluegrass sod with nitrogen, and (5) alfalfa sod, employed in a young Bartlett pear orchard set out in May 1929 at Strongsville, Ohio, the first was the most effective in promoting growth and yield. The average gains per tree in a cross-sectional area of the trunk for the five years 1931–35 were 5.82, 5.64, 5.41, 3.37, and 2.75 sq. in., respectively. The average weight of prunings per tree for the five years 1932–36 was 54.07, 53.19, 41.49, 9.55, and 5.91 oz., respectively. The trees bloomed first in 1932, those in the cultivated plats bearing the most flowers that year. During the four years 1932–35, the trees of the five treatments averaged respectively, 45.06, 44.76, 43.09, 16.33, and 21.13 lb. of fruit. The average fruit from the mulched trees was larger than in any other treatment.

Low soil moisture was found to be the principal factor limiting the growth of trees in the bluegrass and alfalfa plats, the moisture reaching rather frequently the wilting percentage of 9.5. In the 15 months from May to July over the five years, rainfall was deficient by more than 0.5 in. during eight of the months. Depth of rooting was comparatively shallow in all plats, due to the compact nature of the soil. In the alfalfa plats, the buffalo treehopper contributed also to inferior growth. Since the mulched trees grew and fruited almost as well as the cultivated trees, this system of soil management is said to merit consideration under conditions where low soil moisture is frequently an important limiting factor.

The response of D'Anjou pears to fertilizers in central Washington, E. L. Overholser and L. L. Claypool (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 299–303*).—Studies conducted by the Washington Experiment Station upon young vigorous Anjou pears which had borne two fairly large crops prior to the initiation of the experiment showed nitrogen to be the first limiting factor in growth and production. Yield records did not indicate the same differences between plats as were shown by growth measurements because of the marked variation in yield of individual trees. The results showed no direct response to either phosphorus or potassium applied together without nitrogen or in combination with nitrogen. None of the fertilizer treatments had any significant effect on the incidence of cork spot.

Devise speedy test for peach seeds, H. B. Tukey and M. S. Barrett (*Farm Res. [New York State Sta.], 3 (1937), No. 2, p. 10, fig. 1*).—This is a popular presentation of material from a previously noted paper (E. S. R., 75, p. 783).

Types of varietal hardiness in the peach, M. A. Blake (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 240–244*).—Using the terms hardy and hardiness synonymously to indicate capacity to endure an unfavorable environment, the author lists and discusses briefly, with varietal examples, 19 types of hardiness observed by the New Jersey Experiment Stations in the course of many years' work with peaches.

A fertile type of Hale peach found in central Georgia, W. D. Armstrong (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 290–292*).—Observations by the Georgia Experiment Station in an orchard of 5,000 Hale trees near Experiment revealed some trees with wide-open blooms containing an abundance of bright yellow pollen. The fruit on these trees ripened from 3 to 5 days later than Hale and appeared to be intermediate in character between Hale and Elberta. Under cheesecloth cages flowers of the aberrant trees set a good crop when self-pollinated, while under the same conditions Hale trees set only buttons. In a 12-percent sugar solution at 80° F. pollen of the new strain germinated 40 percent as compared with 11 for Elberta. The pollen of the new strain, Georgia Hale, gave good sets of fruit on other varieties, and the new peach is considered promising as a substitute for the original Hale.

Peach tree abnormalities developing from applications of nitrogen fertilizers alone.—Preliminary report, E. H. Rawl (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 293–298*).—Observations in a 14-year-old Elberta peach orchard near Inman, S. C., supplemented with data from experimental fertilizer plats, indicated that for the proper development of cover crops and the foliage, twigs, and fruit, nitrogen alone was not an adequate fertilizer. With nitrogen alone 84.6 percent of the fruits were below 2 in. in diameter, while with an NPK material plus dolomitic limestone 98.2 percent of the peaches were above 2 in. Total yields were greatly increased by the complete fertilizer.

Nodal development of the peach shoot as related to fruit bud formation, M. J. Dorsey (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 245–257, figs. 27*).—Studies at the Illinois Experiment Station of the nodal development in peach shoots grown under different conditions resulted in the proposal of five classes of the nodal growth pattern as follows: (1) A primary leaf without an axillary growth, (2) a single primary leaf but bearing either a fruit or a leaf bud located centrally in the axilla and subtended laterally by scalelike structures in the secondary position, (3) a primary leaf with various combinations of leaf buds and fruit buds in the axil of the greatly reduced secondary structures and in the central position, (4) a primary leaf and one or two leaves in the secondary position and less frequently a tertiary leaf—the number and arrangement of the fruit buds may be similar to that of (3) or very rarely of (2), and (5) a further development of classes (2), (3), and (4) in which elongation of the leaf buds occurs during the current season forming a lateral of varying lengths.

Fruit bud initiation appeared to be determined by the growth conditions prevailing during the early succulent stages of the different parts of the shoot.

Peach thinning investigations.—V, A study of late thinning, M. J. Dorsey and R. L. McMunn (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 280–283*).—Continuing fruit thinning studies (E. S. R., 69, p. 657), small plats in a block of vigorous 8-year-old Gage peach trees were thinned on June 28, July 5, 13, 19, and 30, and August 10 and 21, respectively. At each thinning date there were

removed respectively, on the average, 704, 551, 567, 424, 495, 449, and 355 fruits per tree. At harvest the trees in each treatment yielded an average of 245, 257, 221, 220, 242, 207, 214, and 170 lb. of fruit. The percentages of fruits 2.75 in. or more in diameter were 27, 29, 27, 26, 28, 31, 43, and 31, respectively. Delayed thinning increased the percentage of larger fruits, apparently both by eliminating the smaller sizes and by stimulating development in the remaining fruit. Under favorable growing conditions the control trees, or those with heavier crops, tended to size up fruits and partly offset the differences secured by thinning.

The relation of soil moisture to plant growth, illustrated by moisture meter experiments with strawberries, W. S. ROGERS (*East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 111–120, figs. 9*).—Using a metering instrument designed to give a continuous reading on soil moisture conditions by indicating the capillary pull or suction force of the soil, the author established, in experiments with strawberries in pots and frames, certain minima below which the moisture content should not be permitted to decline if the plants are expected to thrive.

Relation of leaf area to berry production in the strawberry, B. B. SPROAT, G. M. DARROW, and J. H. BEAUMONT (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 389–392*).—Investigations conducted by the U. S. Department of Agriculture at three different locations with eight varieties of strawberries showed at each location a definite positive correlation between the number of leaves per plant in the autumn and the number of flowers and fruits developed in the next season. In the case of potted Howard 17 plants defoliated to 1, 2, 3, 4, and 5 leaves, the flowers per plant were 3.1, 4.6, 6.6, 7.4, and 8.1, respectively, with 10.8 for the control plants. Apparently the larger the leaf area during the autumn when fruit buds were forming the larger the crop the next spring. A varietal difference was indicated in the fact that 8- and 10-leafed plants of Bellmar, Dorsett, Blakemore, and Fairfax averaged, respectively, about 4.7, 5.1, 7.0, and 8.2 berries per leaf.

Temperature in relation to the alternate bearing behavior of the Fuerte avocado variety, R. W. HODGSON and S. H. CAMERON (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 55–60, figs. 2*).—An analysis of yield records taken over a period of years by the University of California at Los Angeles on a total of 598 trees distributed in 5 orchards yielded further evidence (E. S. R., 73, p. 617) on the existence of alternate bearing in the Fuerte avocado. In none of the 10 groups of similar behavior found in the 5 orchards were two heavy crops borne in succession. The larger the crop of any one season, the greater was the certainty of an ensuing small crop. Of the entire group of 598 trees scattered over an area more than a hundred miles long, 32.2 percent alternated in yield regularly throughout the period of record. Temperature during the blooming period was an important factor in maintaining or disrupting the alternate bearing tendency.

Effect of soil temperature on growth of citrus, F. F. HALMA (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 67–69*).—Observations on rooted cuttings of Eureka lemon, Marsh grapefruit, and Valencia orange planted in frames at the California Citrus Experiment Station, the temperature of the soil of which was modified by electric cables under thermostatic control, indicated that the three species may have different optimum temperature requirements. Lemons, which made the greatest growth of all the species at all three temperatures, grew best at the highest range, 61° to 81° F. Oranges and grapefruit made their maximum growth in the range 54° to 72°. All three species grew least at the lowest range, 37% to 68°.

Chemical composition in flowers of citrus varieties, A. R. C. Haas (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 61–66*).—Presenting in tabular form the results of analysis at the California Citrus Experiment Station of whole and portions of the flowers of lemon, orange, and grapefruit, the author points out the probability that when citrus trees bloom heavily and drop many of their flowers there is a considerable loss of inorganic and organic constituents, despite the fact that before leaves or flowers drop a considerable portion of their chemical constituents probably moves back into the tree. Among costituents considered were water, ash, calcium, magnesium, potassium, sodium, reducing and nonreducing sugars, and pectin. There was a considerable content of total pectin in the blooms.

Seasonal changes in the nitrogen content of citrus fruits, S. H. Cameron, D. Appleman, and J. Bialoglowski (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 87–89, figs. 4*).—Continuing studies by the University of California at Los Angeles, on the use of nitrogen by the citrus tree (E. S. R., 73, p. 617), the authors present the results of analyses of lemons, oranges, and grapefruit harvested at biweekly intervals from early stages to several weeks after the commercial harvesting. In all three species, the amount of nitrogen in the whole fruits increased steadily throughout the period of collection. Until early autumn the rinds contained more than half the nitrogen. The analyses showed that if Valencia oranges are left on the trees as long as they will adhere they contain 20 to 25 percent more nitrogen than when picked at commercial maturity. The possible harmful effect of this continued use of nitrogen on the next crop is discussed.

The apparent growth rate of lemon fruits as an index of the moisture supply of the tree, J. R. Furr and C. A. Taylor (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 70*).—Applying three irrigation treatments, (1) so frequent that apparent growth rates were never limited, (2) when apparent fruit growth had ceased or when the trees began to show serious defoliation, and (3) when the first significant decrease in apparent growth rate occurred, there was observed at harvest no significant differences in the size of fruit from the first and third treatments either on medium or heavy soil. On light soil, the first treatment resulted in slightly larger fruits than the third. On all three soils the fruits of trees receiving the second irrigation treatment were much smaller than those on the first and third.

The effect of decreasing soil moisture supply on size of lemon fruits, C. A. Taylor and J. R. Furr (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 71–81, figs. 10*).—Correlating soil moisture records with tree response as measured by size of fruit, it was found in these studies conducted by the U. S. Department of Agriculture that when the first indications of water deficit appeared in the fruit the major part of the roots was in soil which was below the half point on the scale of available moisture. Moisture content was above that at which sunflowers showed the first sign of wilt. When moisture deficit stopped further growth of large fruits, all of the upper 2 ft. of soil was below the point of the first wilting of sunflowers.

A progress report of fertilizer studies with grapefruit in the Salt River Valley, Arizona, A. F. Kinnison and D. W. Albert (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 90, 91*).—Based on 4-yr. studies with mature Marsh grapefruit trees, the Arizona Experiment Station reports that annual applications of available phosphorus supplementing stable manure increased the yield and quality of fruit and tree growth. Supplementary applications of nitrogen or of stable manure tended to lower the grade of fruit and reduced yields. Potash was beneficial to the extent of maintaining previous performance and promoting a better grade of fruit than that of the control trees.

Metaxenia and interspecific pollinations in Phoenix, R. W. Nixon (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 21–26, fig. 1*).—Following an earlier paper (E. S. R., 73, p. 482) on metaxenia induced by pollen of male varieties of the species *P. dactylifera*, the author presents the results secured with pollen of other species of *Phoenix* applied to the flowers of Deglet Noor and other commercial dates.

P. canariensis pollen produced consistently later maturing fruits, in some cases even later than those obtained with any *P. dactylifera* pollen tested. The set of Deglet Noor averaged less than that obtained with *P. dactylifera* pollen, a result conceded due possibly to the necessity of storing the *P. canariensis* pollen 1 or 2 mo. before use. *P. canariensis* pollen gave better sets on Rhars than it did on Deglet Noor. *P. roebelenii* pollen induced very late maturity in the Deglet Noor. Results with *P. sylvestris* were very similar to those with *P. dactylifera*, suggesting a close relationship between the two species. *P. reclinata* pollen produced consistently late ripening Deglet Noor dates, and it is deemed possible that this species may have value in commercial date culture where early maturity is disadvantageous.

Growth rate of Deglet Noor dates in metaxenia, C. L. Crawford (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 51–54, fig. 1*).—Periodic measurements in the U. S. Date Garden, Indio, Calif., of dates resulting from controlled pollinations with males known to produce metaxenial effects showed that the metaxenial effect appears early in the development of the fruit and seeds. Slight differences appeared early and increased until correlated with significant differences at the time of maximum size.

Field and laboratory studies on the behavior of NH_4 fertilizer with special reference to the almond, E. L. Proebsting (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 46–50, fig. 1*).—The results of experiments conducted by the California Experiment Station at Davis with Ne Plus Ultra almonds growing in the western part of the Sacramento Valley, where rainfall averages about 15 in. and falls almost entirely between October and May, showed that applications of ammonium sulfate at the rate of 10 lb. per tree per year promoted growth, larger leaf surface, longer retention of leaves, greater resistance to red spider, and larger yields. The application of irrigation water in later years improved growth and yield of the entire orchard and reduced further the injury from red spider. Nitrogen was even more beneficial under irrigation. Laboratory studies on the penetration of ammonium sulfate into various soils indicate nearly complete fixation in the surface layers.

Influence of pruning and applications of ammonium sulphate on the growth, pistillate bloom and set of nuts on pecan trees, H. L. Crane and F. N. Dodge (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 42–45*).—The results of a study begun in 1931 near Albany, Ga., in a 10-year-old Schley orchard, the trees of which were vigorous and bearing fair crops of nuts, showed that terminal shoot growth and the formation of pistillate flowers were stimulated by applications of ammonium sulfate or pruning, or both. In addition, the percentage of pistillate clusters which set nuts and the number of nuts per cluster were significantly increased by the fertilizer. Pruning alone resulted in almost twice and pruning plus fertilizer more than thrice as many nuts per shoot as compared with untreated trees.

[Ornamental horticulture studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1936, pp. 109, 110*).—Studies are briefly discussed on problems in the culture of hydrangeas, by R. C. Allen; and photoperiodism of the china aster, effects of temperature and length of day on euphorbia, effects of varying temperatures on certain greenhouse plants, and relation between storage temperature and forcing of narcissi, all by K. Post.

Factors associated with bud-drop of sweet peas, and a method of controlling it, R. B. Farnham (*Florists Exch. and Hort. Trade World, 86 (1936), No. 19, pp. 18, 19, figs. 2*).—At the New Jersey Experiment Stations sweet pea plants grown in jars of coarse, washed sand were supplied beginning October 1 with complete nutrient solutions in 4 different concentrations, namely, 0.5, 1, 2, and 3 atmospheres. The plants in the 0.5 and 1 atm. were similar in growth and were classed as low concentration plants as contrasted with high concentration plants for 2 and 3 atm. Daily records during December and early January showed as high as 100 percent bud drop during cloudy periods in the low concentration group, whereas at the same time the high concentration plants held sufficient buds to yield a fine Christmas crop of blooms. Flower yields from October 23 to February 1 showed average total yields of over 50 flower-bearing stems per plant in the high concentration group as compared with something over 30 for the low concentration group. A tabular summary is presented of the effects of the different concentrations on root, plant, and leaf development.

FORESTRY

[**Forestry investigations by the Cornell Station**] ([*New York*] *Cornell Sta. Rpt. 1936, pp. 79, 111, 112*).—Brief notes are given on the calcium requirements of different tree species and the correlation between this factor and the ecological distribution of species, by R. F. Chandler, Jr.; improved practice in the production of forest planting stock of broad-leaved timber-tree species, by J. N. Spaeth and M. Afanasiev; establishment, culture, and development of forest plantations, by Spaeth; and some relationships between forest-tree rooting, and soil type, ground-water level, and soil temperature, by Spaeth and C. H. Diebold.

Relation of soil character as expressed by certain soil types to the choice of land for forestry in the cut-over pine lands of northern Michigan, R. L. Donahue (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 79, 80*).—Of eight soil types in northern Michigan where the dominant virgin species was pine, Ogemaw sandy loam and Roselawn sandy loam soils were rated as first-class pine land; Roselawn sand, Rubicon sand, and Bridgman fine sand soils were second class; and Saugatuck sand, Wallace fine sand, and Grayling sand soils were third class. In general, a sandy loam texture contributes toward making a good pine site and hardpan or coarse dry soil tends toward a poor site.

Soil characteristics in relation to the occurrence and growth of black spruce, R. H. Westveld (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 45–47, figs. 2*).—Studies by the Michigan Experiment Station on the occurrence and growth of black spruce in relation to certain soil characteristics showed that soil moisture plays an important part in the distribution of this species. Although tolerating wet soil, growth was inferior in such locations. In general, for both mineral and organic soils, black spruce grew most rapidly where it was rather poorly represented in the stand, suggesting the desirability of favoring this species in selective cuttings, especially when the associates were of inferior commercial value.

Soil changes associated with forest fires in the longleaf pine region of the South, F. Heyward (*Amer. Soil Survey Assoc. Bul. 17 (1936), pp. 41, 42*).—Observations over an extended area from Georgia to Louisiana indicated that soils protected from fire are much more penetrable and porous than those subjected to fire. Burned-over soils showed a slightly higher ignition loss, probably due to charcoal. In addition, they contained more replaceable calcium and probably other ash constituents and were, therefore, slightly less acid. They also contained a higher percentage of total nitrogen. There was no evi-

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dence that severe soil degradation follows periodic fires nor, on the other hand, that the soils of the region are benefited definitely by fires.

Trends in the nitrogen, phosphorus, potassium, and calcium content of the leaves of some forest trees during the growing season, H. L. Mitchell (*Black Rock Forest Papers, 1 (1936), No. 6, pp. 30–44, figs. 6*).—Observations on leaf samples collected in late May, June, July, August, and September from trees of white, chestnut, and red oaks, shagbark hickory, sugar and red maples, and Norway spruce showed that the leaves of deciduous species continue to gain in weight as long as they remain green. The trends in moisture content were opposite to those of dry weight. The concentration of nitrogen, phosphorus, and potassium in the leaves of all species decreased quite rapidly during the period of greatest leaf growth but tended to become relatively constant in the month previous to yellowing. At the same time, the absolute amount of N, P, K, and Ca in the leaves increased as the season advanced, attaining a maximum just prior to the change in color in autumn. Migration of N, P, and K from the leaves back into the conducting tissues of the trees was observed after the leaves began to yellow, but there was no evidence of any such movement as long as the leaves were green and vigorous.

The relative feeding power of oaks and maples for soil phosphorus, H. L. Mitchell and R. F. Finn (*Black Rock Forest Papers, 1 (1935), No. 2, pp. 5–9, fig. 1*).—Data obtained on the phosphorus content of the leaves of white oak, chestnut oak, and sugar maple growing on experimental fertilizer plats showed that phosphorus absorption tends to vary between genera but not between species. It was strongly indicated that the maple has a greater feeding power, at least for soil phosphorus, than has the oak.

An introduction by A. C. Cline is included.

Nutritional studies on loblolly pine, R. M. Addoms (*Plant Physiol., 12 (1937), No. 1, pp. 199–205, figs. 2*).—Experiments at Duke University with seedlings grown in sand cultures showed that the loblolly pine is able to utilize nitrogen either as nitrate or ammonium. Alteration of the acidity over a wide range revealed the best development in the case of calcium nitrate when the solution was decidedly acid and in the case of sulfate of ammonia when the solution was more nearly neutral. The young trees compared favorably with those growing in soil except that there was a yellowing of the foliage from time to time in both series due, aparently, to temporary deficiency in available nitrogen. The failure of mycorhiza, present when the seedlings were set out, to develop to any considerable degree in the sand cultures is believed suggestive of the probability that mycorhiza are incidental rather than highly beneficial to the loblolly pine.

The effect of varied solar radiation upon the growth, development, and nutrient content of white pine seedlings grown under nursery conditions, H. L. Mitchell (*Black Rock Forest Papers, 1 (1936), No. 4, pp. 15–22, figs. 2*).—The total yield (roots and shoots) of white pine seedlings was found to vary directly with radiation intensity. Over the entire range, including full sunlight, increased light resulted in increased yields. Light variation had a relatively greater effect on root development than on the aerial portion of the plants. The seedlings were grown on a relatively infertile soil and received no other care than weeding and an occasional watering during dry periods.

A chestnut oak volume table for the Hudson highland region, H. H. Tryon and R. F. Finn (*Black Rock Forest Papers, 1 (1935), No. 3, pp. 13, 14*).—Based on data collected in eight separate cutting operations involving 2,228 trees, there is presented a volume table for chestnut oak. In a field trial the table underestimated the actual cut by about 4 percent.

DISEASES OF PLANTS

Insect and cryptogamic parasites of fruit, ornamental, horticultural, and agronomic plants. Fungicides and insecticides: Methods of their use against parasites, O. TRAVERSO (*Insetti e crittogame parassiti delle piante da frutto, ornamentali, ortensi e agrarie. Anticrittogamici e insetticidi: Metodi per usarli contro i parassiti. Roma: P. and A. Ingegnoli, [1935], pp. XV+268, figs. 117*).—This is described as a "technical-practical manual for the use of agronomists, horticulturists, and amateur gardeners."

A contribution to the physiology of diseased plants, V. F. KUPREVICH (V. TH. KUPREWICZ) (*Leningrad: Akad. Nauk S. S. S. R., 1934, pp. 71, figs. 11; Eng. abs., pp. 69–71*).—The author reports the results of a series of comparative studies on the physiological processes occurring in healthy v. fungus- or virus-infected plants, including *Cirsium arvense* infected by *Puccinia suaveolens*, field peas by *Mycosphaerella pinodes*, *Trifolium hybridum* by *Erysiphe communis*, and potatoes infected by mosaic, leaf roll, and aucuba viruses. A bibliography of 159 titles is included.

The Plant Disease Reporter, January 15 and February 1, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 1, pp. 14, figs. 2; 2, pp. 15–40, figs. 3*).—Among other things of current interest included are the following:

No. 1.—Curly top and other diseases of spinach in Texas, by J. J. Taubenhaus and G. E. Altstatt; reducing leaf spot (*Mycosphaerella fragariae*) and leaf scorch (*Diplocarpon earliana*) injury to strawberry calyxes by use of a winter mulch, by J. B. Demaree and M. S. Wilcox; nut diseases (Persian walnut and filbert) in the Pacific Northwest in 1936, by P. W. Miller; downy mildew (*Pseudoperonospora humuli*) of hops in Washington and Oregon in 1936, by G. R. Hoerner; downy mildew of hops in California in 1936, by D. G. Milbrath; *Verticillium* wilt of smoketree (*Cotinus coggyaria*), by M. E. Fowler; dodder on peppertrees in California, by G. R. Johnstone; and brief notes on plant diseases (including charcoal rot (*Rhizoctonia bataticola*) on corn in Missouri, by C. G. Schmitt, mosaic on black raspberry in Washington, by G. A. Huber, and rust on greenhouse-grown Clarkias in New York, due to *Pucciniastrum pustulatum*, by P. P. Pirone).

No. 2.—An analysis of volume 20 of The Plant Disease Reporter; notes on the effect of environmental conditions on fruit crop and fruit diseases in the Ozark section in 1936, including observations in (1) Arkansas, by J. C. Dunegan, and (2) Missouri, by M. A. Smith; occurrence of tobacco diseases in Virginia in 1936, by J. A. Pinckard, J. Godkin, and R. G. Henderson; "concealed damage" (due to soil fungi) of runner peanuts in Georgia, by H. W. Rankin; rice kernel smut (*Tilletia horrida*) in Texas, by E. C. Tullis; notes on the stinking smuts of wheat in Turkey in the 1936 crop, by D. P. Limber; crown gall of the fasciated type on *Asparagus sprengeri*, by N. A. Brown and F. Weiss; relative susceptibility of certain varieties of dahlias to root knot nematode (*Heterodera marioni*), by R. Schmidt; and diseases of shade and ornamental trees—summary of specimens received in 1935 and 1936 at the New Haven office, Division of Forest Pathology, by A. M. Waterman.

[Phytopathological studies by the California Station] (*California Sta. [Bien.] Rpt. 1935–36, pp. 23, 66–84*).—Progress reports are given on studies of iron chlorosis of fruits; citrus mottle-leaf—a physiological disease; control of little leaf of deciduous fruit trees; zinc for walnut little leaf; die-back and rosette of apples; prune die-back; black end of pears; fire blight—a bacterial disease; olive knot or tuberculosis; *Coryneum* blight on peaches—a fungus

disease; *Corynuem* blight and blossom blight on almonds; a new root rot (*Rosellinia*) of fruit trees; preventing citrus fruit rots and damping-off; *Dothiorella* rot of avocados; date palm disease (rhizosis, *etc.*); fungus diseases of vegetables; so-called *Ascochyta* blight of peas; *Fusarium* diseases of vegetables; downy mildew of hops; fungus causing southern root rot of sugar beets; control of southern root rot; peach mosaic—a virus disease; buckskin, a virus disease of sweet cherries; vegetables and ornamentals affected with spotted wilt; transmission of spotted wilt; a new disease of grapevines (unidentified, but possibly of virus etiology); transmission of sugar beet curly top; virus diseases of celery; and mosaic diseases of cauliflower and stock.

Plant pathology (*Hawaii Sta. Rpt. 1936, pp. 33–40, fig. 1*).—Progress reports are given on diseases of the taro and their control (including three types of corm rot and diseases of the leaves) by G. K. Parris and F. A. I. Bowers; and diseases and insect pests of tomatoes and truck crops, by Parris. A list of fungus diseases and insect pests noted on various crop plants in Hawaii is included.

[**Phytopathological studies by the Cornell Station**] (*[New York] Cornell Sta. Rpt. 1936, pp. 92, 115–123, 145, 146*).—Progress reports are given on the following studies: Permanent crop improvement through the control of disease by the development of immune or disease-resistant stocks, and virus diseases, both by D. Reddick; the Dutch elm disease, by D. S. Welch, K. G. Parker, L. J. Tyler, P. A. Readio, and D. L. Collins; *Nectria* canker of basswood and other hardwood species, by Welch; studies on species of *Sclerotinia* and related genera in North America—III, *Ciboria acerina* n. sp., by H. H. Whetzel and N. F. Buchwald; diseases of roses, by L. M. Massey, E. W. Lyle, and K. Longree; the cork and rosette diseases of apple, by A. B. Burrel and H. J. Miller; lime-sulfur and substitute fungicides for the control of apple scab and leaf scorch in western New York, by W. D. Mills; overwintering of the fire blight organism in Baldwin apple trees suffering from severe winter injury, by E. M. Hildebrand; the role played by the honeybee and the beehive in the fire blight disease, by Hildebrand and E. F. Phillips; incidence of fire blight in young apple trees in relation to orchard practices at Ithaca, by Hildebrand and A. J. Heinicke; control of onion mildew, and control of *Botrytis* rot of lettuce, both by A. G. Newhall; lettuce yellows and other virus diseases, by M. B. Linn and Newhall; a bacterial leaf spot of geranium (due to *Phytomonas geranii* n. sp.), and a bacterial blight of iris (ascribed to *P. phyllosinces* n. sp.), both by W. H. Burkholder; a comparative study of some yellow proteolytic bacterial plant pathogens (*Phytomonas* spp.), by C. C. Wernham and Burkholder; a comparative study of some species of *Actinomyces* isolated from scabby potatoes, by C. F. Taylor and Burkholder; diseases of narcissus and other flowering bulbs, by F. A. Haasis, C. E. F. Guterman, and F. Weiss; diseases of cyclamens and other potted plants, by J. M. Bickerton, Guterman, and Massey; aster rust and its control, by Guterman; diseases of lilies, by D. K. O'Leary and Guterman; factors affecting the efficiency of potato spraying, by F. M. Blodgett, E. O. Mader, O. D. Burke, and R. B. McCormack; scab, *Rhizoctonia*, and pitting of potatoes, by Blodgett, Taylor, and E. K. Cowan; potato yellow dwarf, by L. M. Black, K. H. Fernow, and Blodgett; and browning of cauliflower (nonparasitic and controlled by boron applications to the soil), by G. J. Raleigh, W. C. Barnes, and C. H. Dearborn.

Plant diseases (*West Virginia Sta. Bul. 278 (1936), pp. 24–27, fig. 1*).—Brief reports are given on the black pox of apple, identified as due to the black root rot fungus; the relationship of the soft rot and colon groups of bacteria; and the influence of growth substances on some 200 representative fungi.

Report of the plant pathologist: Virus diseases of plants, H. H. Storey (*East African Agr. Res. Sta., Amani, Ann. Rpt., 7 (1935), pp. 12-16*).—Brief notes are given on the mechanism of the transmission of plant viruses by insects and on mosaic disease of cassava.

The susceptibility of the plant cell to virus disease, F. M. L. Sheffield (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 498-505, fig. 1*).—A number of experiments, using the viruses of aucuba mosaic of tomato and mosaic of tobacco sprayed on several host plants, indicated that they could not enter a plant unless some of the cells were injured. It was not essential that injury should accompany the presence of the virus. The chances of infection fell off rapidly in the first few minutes after injury, but infection occurred occasionally as long as ½ hr. after cell damage. Inoculations by micropipette into single host cells yielded only about one-tenth the expected number of infections, suggesting differences in the susceptibility of the cells to virus attack.

The role of plasmodesms in the translocation of virus, F. M. L. Sheffield (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 506-508, pl. 1*).—A study of epidermal strippings from leaves of tomato, tobacco, *Hyoscyamus niger*, and *Solanum nodiflorum* revealed no protoplasmic connections between the guard cells and the surrounding tissues. Since inclusion bodies have been found in all cells of the epidermis except the guard cells, these findings suggest that owing to the absence of plasmodesms the virus is unable to reach the guard cells. Support is also lent to the view that in the ground tissue of the plant the virus is carried from cell to cell along the protoplasmic bridges.

Factors affecting the amount of infection obtained by aphis transmission of the virus Hy. III, M. A. Watson (Hamilton) (*Roy. Soc. London, Phil. Trans., Ser. B, 226 (1936), No. 540, pp. 457-489, figs. 9*).—Using the vector *Myzus persicae* of tobacco virus Hy. III and leaves of corresponding age for all feedings, a maximum percentage of infection was obtained during winter and a minimum during summer. The percentage of infection increased with the number of aphids per plant, and the relation between the numbers of infections for each aphid number indicated that infections are local and independent. The percentage of infection increased with increased feeding time on the healthy plant, but there was no indication of a preliminary period in which no infection occurred. The percentage of infection decreased very rapidly with increasing time on the infected plant from 2 min. to 1 hr., but after 1 hr. it increased slightly with further increase in the feeding periods. Uncertainty as to whether aphids had fed on the trial leaves for the exact period allowed was overcome either by "watched feedings" or by allowing an average "penetration time" of 5 min. Penetration time was increased by decreasing the relative humidity of the insectary. *M. persicae* proved capable of infecting two consecutive plants without intervening access to a source of infection, but the number of second infections decreased rapidly with increasing time on the healthy plant and was negligible for 1 hr.

Comparisons are made between this and other viruses which appear to be of the same type, and suggestions are made as to the causes of some effects and the mechanisms of infection which are involved.

The reaction of the viruses of tomato spotted wilt and tobacco mosaic to the pH value of media containing them, R. J. Best and G. Samuel (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 509-537, figs. 6*).—Activity-time curves and activity-pH curves are presented for these two viruses. The results indicated that the spotted wilt virus is rapidly inactivated at and below pH 5 and above pH 10. There was no significant difference in activity over the pH range 6-8.9 for ½ hr. or a 5-hr. contact. Tests with the mosaic virus indicated that

it is inactivated above pH 8.2 and below pH 2, the extent varying with pH value and being complete at pH 11 and 0.5. There was no significant difference in activity of the virus over the pH range 2–8 in the adjusted suspensions and over the pH range 6–8 in the unadjusted suspensions.

The bearing of the results on various virus problems is discussed, and it is noted that at least in the case of tobacco-mosaic virus they strongly suggest its nonorganismal nature.

Tumors obtained by inoculation of Bacterium tumefaciens into embryos and young plants cultivated aseptically [trans. title], A. BERTHELOT and G. AMOUREUX (*Compt. Rend. Acad. Sci.* [*Paris*], *203* (*1936*), *No. 14, pp. 629–631*).—The method of culturing embryos and young plants in aseptic media was used successfully on pea, *Ricinus*, sugar beet, sunflower, tobacco, tomato, and cucurbits. It is believed that this technic offers a means of studying more easily the direct passage of the infective agent (*B. tumefaciens* [=*Phytomonas tumefaciens*]) from plant to plant, the appearance of metastases, and tumor grafts, and of attempting the culture of neoplastic tissues under particularly favorable conditions.

Successful results from treatment of plant tumors with mitogenetic rays emitted by mosquito larvae [trans. title], W. STEMPELL, G. V[ON] ROMBERG, and R. ULPTS (*Biol. Zentbl.*, *56* (*1936*), *No. 3–4, pp. 114–116, fig. 1*).—Plant tumors induced by *Bacterium tumefaciens* [=*Phytomonas tumefaciens*] were strongly retarded in development by treatment with living larvae of *Corethra plumicornis*, and in 25 percent of the cases these tumors were completely inhibited within the observation time (3 mo.).

Intraspecific and interspecific aversion in Diplodia, P. E. HOPPE (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 9, pp. 671–680, figs. 2*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station, intraspecific aversion was found in *D. zeae* and *D. macrospora* and interspecific aversion between these two species. The stability of the particular aversion reactions of different strains of *D. zeae* was maintained after successive mycelial propagations, through successive pycnidial generations, and through inoculation into ears of corn and subsequent reisolation. It is believed that the differences among the strains are genetic, and that the number of strains of *D. zeae* is very large.

Identification of the strains recovered from ears of corn which had been inoculated with various combinations of mixtures of strains proved that inhibitory effects had occurred, so that usually only one strain of the fungus could be reisolated from an ear. A definite sequence appeared to exist in the inhibitory powers of the strains upon one another. No conclusions were drawn regarding the relationship between the capacity of strains for inhibiting the development of others and their degrees of pathogenicity.

Morphological aspects of Gymnosporangium galls, P. R. MILLER (*Phytopathology*, *26* (*1936*), *No. 8, pp. 799–801, fig. 1*).—The author observed a greater abundance of galls of *G. juniperi-virginianae* on awn-shaped than on scalelike leaves of *Juniperus virginiana*. Stained preparations indicated that the galls in the former case were of leaf origin, whereas those from trees with scalelike leaves were of stem origin.

A technic was developed whereby clearly visible sections of galls in various stages could be made easily and rapidly from fresh material. In this way the method of emergence of the gelatinous spore horns through the tough cortex of the gall was shown to be by means of circular cortex caps, lifted and pushed aside by the emerging spore horns.

Biological study of Phoma buxi and Strigula buxi, J. NAHAS (*Étude biologique sur le Phoma buxi et le Strigula buxi. Thesis, Univ. Genève, 1935,*

pp. 63, pls. 2, figs. 19).—The author presents a study of a fungus, *P. buxi*, and a lichen, *S. buxi*, from box (*Buxus sempervirens*), including the morphology, physiology, cultural characters, and life history of the fungus (which is stated to have no injurious effects on the host), and the morphology, relations of the fungus to the alga, and pathogenic action of the lichen on the host. It is said that in its pathogenesis it resembles the parasitic fungi, but that its action is slower.

North American species of Sclerotinia and related genera, III, IV (*Mycologia, 28* (*1936*), *No. 6, pp. 514–527, figs. 19; 29* (*1937*), *No. 1, pp. 128–146, figs. 18*).—In the first of these contributions from Cornell University, *Ciboria acerina* n. sp. is described and illustrated by H. H. Whetzel and N. F. Buchwald. It is reported to be common on *Acer rubrum* and *A. saccharinum* and to have been found on certain other hosts. Its cultural characters and life history are detailed, and notes on related matters are included.

In part 4, by H. H. Whetzel, *Septotinia*, a new genus of the Ciborioideae, and *S. podophyllina* n. comb. are described and illustrated. The conidial stage is reported as pathogenic to leaves of *Podophyllum peltatum*, and the taxonomic relationships, distribution, cultural characters, and life history of the fungus are discussed.

The staining of mycelium in woody tissues [trans. title], S. Kościelny (*Rocz. Nauk Rolnicz. i Leśnych* (*Polish Agr. and Forest Ann.*), *36* (*1936*), *No. 3, pp. 496–500; Ger. abs., pp. 499, 500*).—Using safranine (alcoholic) and aniline blue, the procedure detailed is said to stain woody tissues red and the nonwoody parts and mycelia blue or dark blue.

Zone lines in plant tissues.—III, The black lines formed by Polyporus squamosus (Huds.) Fr., A. H. Campbell and R. G. Munson (*Ann. Appl. Biol., 23* (*1936*), *No. 3, pp. 453–464, pls. 2*).—Continuing this series (E. S. R., 71, p. 214), the black lines were found in elm wood and *P. squamosus* was isolated from them and cultured. It is suggested that the black lines or plates form a limiting layer of sclerotiumlike bodies buried in the attacked wood.

Fungicides in relation to foliage injury and fruit yield, A. B. Groves (*Peninsula Hort. Soc.* [*Del.*] *Trans., 49* (*1935*), *pp. 58–60*).—This contribution by the Virginia Experiment Station briefly discusses the subject, and adds data from a field test as showing higher yields and better retention of foliage with copper and sulfur sprays than with the controls or lead arsenate alone.

Spraying tests with copper fungicides on leaves wettable with difficulty [trans. title], Schmidt (*Blumen u. Pflanzenbau ver. Gartenwelt, 40* (*1936*), *No. 2, p. 20, fig. 1*).—The comparative merits of various stickers in spray mixtures are discussed, and favorable results in coverage are reported from the addition of "Tezet" to copper fungicides. How well the mixture will control fungus diseases of such plants as carnations and cabbages must be determined by further tests.

Relative susceptibility of certain species of Gramineae to Cercosporella herpotrichoides, R. Sprague (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 9, pp. 659–670*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Oregon, Idaho, and Washington Experiment Stations, field and greenhouse inoculations indicated that a large number of species of cereals and other grasses are susceptible to *C. herpotrichoides*, but most range grasses are sufficiently resistant to avoid serious injury in the field under the semiarid conditions and thin stands of the prairie lands in the Pacific Northwest. *Agropyron* spp., *Bromus tectorum*, and several other grasses have been found infected under natural conditions at the edges of wheat fields infected with *C. herpotrichoides*.

Under optimum conditions for the disease, the greenhouse results indicated that certain late varieties (e. g., Hosar and Hohenheimer), apparently resistant in the field, in reality had merely escaped the disease and were without genetic factors for resistance.

While most wheats gave very little indication of genetic resistance, certain *Aegilops* and *Triticum* species were very resistant and the possibility of the eventual development of resistant wheats by crossing with them is pointed out.

The *Cercosporella* foot rot has apparently been present on native prairie grasses in the Columbia Basin for many years.

Influence of environment during maturation on the disease reaction and yield of wheat and barley, B. B. Bayles (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 10, pp. 717–748, figs. 6*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station, seed of four varieties of spring wheat and three of spring barley produced at several experiment stations in the United States and Canada in 1929–30 was tested for reaction to seedling blight (*Gibberella saubinetii*) in the greenhouse at Madison and for reaction to bunt (*Tilletia laevis*) and for yield in field trials at Moccasin, Mont., Madison, Wis., and Aberdeen, Idaho.

Environal conditions under which the seed was produced affected the reaction to seedling blight in the subsequent crop. A relationship was found between low protein in the seed and high resistance indexes and in some cases between large seed and high resistance indexes, but these factors did not account for all differences. The results suggested that differences of a nutritional or biochemical nature were more important than morphological or size differences in the embryo and endosperm.

The environal conditions under which the seed was produced also affected the reaction to bunt, but the effects were much less pronounced. A small correlation (−0.3036, $P=0.01$) was found between seed size and reaction to bunt, the larger seed producing a lower percentage of infected plants.

Only 3 of 91 seed lots produced under different environal conditions differed significantly from other seed lots of the same variety in capacity to yield. Statistically significant correlation coefficients were obtained, however, for weight of 1,000 kernels sown and dry weight of 100 seedlings at about the fifth-leaf stage (+0.9312, $P<0.01$ for wheat, and +0.8213, $P<0.01$ for barley) and for weight of 1,000 kernels sown and yield of grain (+0.4026, $P=0.02$ for wheat, and +0.4049, $P=0.05$' for barley).

Influence of black point disease, seed treatment, and origin of seed on stand and yield of hard red spring wheat, L. R. Waldron (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 10, pp. 781–788*).—In studies by the North Dakota Experiment Station, wheat seed with visible infection by *Helminthosporium sativum* produced a crop not appreciably affected in yield or other characters except for a slight difference in seedling stand. The application of Ceresan to diseased seed before planting also had no apparent effect on the yield or other characters, but bunt spores applied to the seed reduced the yield in all cases to a significant degree, the loss in yield of the susceptible Ceres variety being pronounced. Seed grown in the greenhouse (exceptionally heavy in kernel weight) produced decidedly larger yields than other seed tested, the larger yields evidently being due to larger initial and mature stands.

The interlocking type of experiment described was effective in reducing the standard error because of a relatively large number of degrees of freedom, comparatively small experimental differences thus showing significance.

Effect of vernalization on the incidence of loose smut in wheat, W. F. Hanna (*Sci. Agr.*, *16* (*1936*), *No. 7, pp. 404–407; Fr. abs., p. 407*).—"The effect

of environmental conditions on the development of loose smut of wheat and barley is discussed, and the literature on this subject is reviewed. The incidence of loose smut in artificially inoculated seed of Marquis wheat was not appreciably affected by vernalization."

Nitrogen utilization by Ophiobolus graminis, H. FELLOWS (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 10, pp. 765–769*).—*This is a cooperative investigation by the U. S. D. A. Bureau of Plant Industry and the Kansas Experiment Station.*

When sown in synthetic liquid media, *O. graminis* (the cause of take-all of wheat) grew when the nitrogen source was egg albumen, casein, peptone, or nucleic acid, but 45 other sources of organic and inorganic nitrogen proved unavailable and organic and inorganic growth-promoting materials did not render them available. Vegetable media of many kinds favored its growth.

Pusa 120: A wheat highly resistant to yellow rust, F. J. F. SHAW and B. P. PAL (*Agr. and Livestock in India, 6* (*1936*), *No. 2, pp. 202, 203*).—Pusa 120, a strain selected from the progeny of a cross between Pusa 52 and the Australian variety Federation, proved very highly resistant in greenhouse tests to the three physiologic forms of yellow rust thus far known in India. Another high yielding strain with considerable resistance is Pusa 165, a cross between Pusa 4 and Federation.

Role of insects in the distribution of cotton wilt caused by Fusarium vasinfectum, J. J. TAUBENHAUS and L. D. CHRISTENSON (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 9, pp. 703–712, fig. 1*).—In this study by the Texas Experiment Station, the following cotton insects were caged and fed on roots, stems, and leaves, or bolls of cotton infected with typical *Fusarium* wilt: *Melanoplus femur-rubrum*, *M. differentialis*, *Schistocerca americana*, *S. obscura*, and other less abundant grasshoppers; larvae of *Alabama argillacea*, *Laphygma frugiperda*, and *Prodenia ornithogalli*; a number of white grub species; and larvae of *Ataxia crypta*. Viable *F. vasinfectum* was isolated from fecal pellets or entire insects cultured on potato-dextrose agar. It was not recovered from, and was apparently destroyed in, the alimentary tract of wireworms, Collembola, and Japygidae. Viable *F. vasinfectum* was recovered from cultures of the entire insects or of fecal pellets dissected out from the recta of numerous species collected in badly wilted cotton fields. The following insects were found to act as natural carriers: *M. differentialis*, *M. mexicanus*, *M. femur-rubrum*, *Encoptolophus texensis*, *Spharagemon cristatum*, *Tomonotus aztecus*, *Chortophaga viridifasciata australior*, *Schistocerca americana*, *S. obscura*, *Trimerotropis citrina*, and *Dissosteira carolina*. It still remains to be proved whether the boll weevil can act as a carrier.

Cotton seedlings were sucessfully inoculated with strains of *Fusarium* isolated from the alimentary tract of insects and with a pure culture of *F. vasinfectum* from infected cotton. *F. vasinfectum* has survived for 15 mo. in fecal pellets from grasshopers fed on wilt-infected cotton stems and kept dry in the laboratory.

It is suggested that these results may help to explain the occasional finding of infected plants in areas where the disease does not ordinarily occur.

Sclerospora graminicola on millet in Minnesota, C. S. WANG (*Phytopathology, 26* (*1936*), *No. 5, pp. 462–464, figs. 2*).—In this investigation at the University of Minnesota, both primary and secondary infections of downy mildew were found on millet (*Setaria italica*) and on foxtail grass (*S. viridis*) in 1935 at two places in Minnesota. Conidia of *Sclerospora graminicola* formed during both day and night at temperatures of from 17° to 34° C. and relative humidity of from 75 to 100 percent. When old conidiophores were removed, a new crop was formed in from 4 to 6 hr. Conidiophores on *Setaria viridis* were shorter than those on *S. italica*, and the normal and giant conidia on *S. viridis* were

slightly smaller than those on *S. italica*. Conidia usually germinated by producing four biciliate zoospores, which were active for about 30 min. and then became encysted. Germ tubes were formed later, and under suitable conditions infection followed.

"Running out" of potatoes [trans. title], E. KLAPP (*Forschungsdienst, 1 (1936), No. 1, pp. 33-38*).—This is a general review, with 38 literature references.

The viruses causing top necrosis (acronecrosis) of the potato, F. C. BAWDEN (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 487-497*).—Top necrosis was induced in different potato varieties by a number of viruses, the reactions of which on a large number of commercial varieties are given, together with some of their properties and the methods of transmission. By grafting and needle inoculating infected potatoes to the varieties Epicure, Arran Victory, President, and Up-to-Date and noting the type of necrotic disease induced, it was possible to distinguish with fair accuracy six viruses, the necrotic reactions to which are tabulated.

The blackening of the flesh of the potato tuber, R. J. SCOTT (*Scot. Jour. Agr., 19 (1936), No. 2, pp. 180-182*).—The formation of melanin in potato tubers, with the resultant darkening of the tissues, may be due to age, frost, high temperatures, etc., and it may be assumed that blackening will occur whenever the tissues are killed by any means other than those which deactivate the enzymes. The experiments described show clearly that blackening may also be due to bruising, and this blackening does not disappear when the tubers are cooked but may even increase.

Investigations on the nematode disease of potatoes caused by Anguillulina dipsaci, E. E. EDWARDS (*Jour. Helminthol., 14 (1936), No. 1, pp. 41-60*).—From the experiments here described and those reported in the literature for other strains of *A. dipsaci*, it is deemed evident that no chemical treatment of the soil can be recommended as sufficiently practical for commercial adoption. However it was found that elimination of infestation from the soil can be effected by introducing well-planned crop rotations. Extensive observations in infested areas seemed to indicate that the strains of *A. dipsaci* on other crops do not infest potatoes, and that the potato form is so specialized to this host, at least in the regions studied, that any other agricultural crop may be used in the potato rotation. From these observations, 3 yr. are deemed a sufficient interval between potato crops, though cases of satisfactory crops after a 2-yr. rest are known. The possibility of wild hosts would suggest effective weed control between potato crops as an insurance measure.

From the results of field variety trials by the author and others, it would appear that the principal varieties in commercial use are subject to rather heavy attacks. An exception is made for King Edward, which appeared to suffer decidedly less injury than any other common variety. Where rotation on infested land is impractical, the author's results would justify the growing of varieties which can be harvested not later than about mid-August. The crop should then be disposed of as soon as possible or stored under perfectly dry conditions.

Pot infection experiments were not very conclusive as to whether the disease is sufficiently manifest in the aerial parts for its early detection in the growing plant. Definite experimental evidence was obtained that even slightly infested tubers or tuber material can initiate soil infestations.

Histological and cytological changes in sugar-beet seedlings affected with curly top, E. ARTSCHWAGER and R. C. STARRETT (*Jour. Agr. Res. [U. S.], 53 (1936), No. 9, pp. 637-657, pls. 13*).—Early primary disturbances induced by the

virus are limited to the pericycle and immature cambium derivatives. The affected cells and their nuclei hypertrophy (and in this process the latter may expand symmetrically), become irregular, or assume odd shapes. Changes in the affected cells are marked by two phases which usually overlap, their relative duration apparently depending on the age of the cell when infected, its immediate environment, and the degree of initial stimulation. During the first (anabolic) phase there is an increase in nucleolar material and chromatin, accompanied by morphological changes in the latter. The threshold of the second (catabolic) phase marks the beginning of irreversible changes in the nucleus, often characterized by dissolution phenomena and the possible emission of altered chromatin. Nucleolar fragments also find their way into the cytoplasm and remain there unaltered, but often lose their visible identity due to proteolytic cytoplasmic changes. Cytoplasmic changes usually parallel those in the nucleus during the early stages, and later stages are marked either by mere quantitative reduction or by disorganization from local or general proteolysis. Of the two types of cytoplasmic inclusions, the first includes calcium oxalate and leucoplasts, normal to healthy plants but often enormously increased in affected roots. The second type includes structures foreign to healthy cells. Prominent, though transitory, are nucleolar fragments and possibly chromatin extrusions with the chromatin greatly altered. Amorphous precipitates exhibiting great variation in staining reactions are also very common. Though their origin is not always clear, it can be attributed to the disintegration of certain compact inclusion bodies and to local cytoplasmic proteolysis.

Resulting from apparently misdirected differentiation in the maturation of cambium derivatives, sieve-tube-like elements with plastids and slime bodies but without sieve plates are formed. The cell walls become covered with pseudocallus. The cells of the supernumerary cambiums and their derivatives divide longitudinally, and incomplete longitudinal divisions, resulting in binucleate and multinucleate cells, are common.

Negative evidence on multiplication of curly-top virus in the beet leafhopper, Eutettix tenellus, J. H. Freitag (*Hilgardia [California Sta.], 10 (1936), No. 9, pp. 305–342, figs. 10*).—An extensive series of experiments involving controlled management of the vectors and host plants resulted in the development of no direct or indirect evidence of the multiplication of the virus within the vector. On the other hand, considerable circumstantial evidence is presented indicating that the virus does not multiply in the body of this insect.

The control of heart and dry rot of beets [trans. title], Hille (*Zuckerrübenbau, 18 (1936), No. 2, pp. 30–33, figs. 2*).—This is a review of experimental data on this disease, including its control by soil applications of boron.

Sugar-beet production in California, W. W. Robbins and C. Price (*Calif. Agr. Col. Ext. Circ. 95 (1936), pp. 78, figs. 35*).—In this general handbook on sugar beets and their culture, by the California Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, the following phytopathological matters are discussed: Controlling the sugar beet nematode, southern *Sclerotium* root rot, downy mildew, curly top, and the sugar beet leafhopper in relation to curly top.

Control of sweet potato wilt, T. F. Manns (*Peninsula Hort. Soc. [Del.] Trans., 49 (1935), pp. 46, 47*).—Carrying over in the soil is not as active in sweetpotato wilt as in *Fusarium* wilt diseases of some other crops, but the fungus is carried over internally in the "seed." This contribution by the Delaware Experiment Station therefore recommends the field selection of seed at harvest time or slipping to eliminate this and other diseases.

Further information relating to the control of Raan in swedes, D. G. O'Brien and R. W. G. Dennis (*Scot. Jour. Agr., 19 (1936), No. 1, pp. 40–46, pl. 1, fig. 1*).—"Raan" or boron deficiency disease in swedes was eliminated by 20 lb. of borax per acre applied just prior to sowing.

Ineffective principle and plant cell in some virus diseases of the tobacco plant, III, T. H. Thung (*Tijdschr. Plantenziekten, 43 (1937, No. 1, pp. 11–32, pls. 5; Eng. abs., pp. 25–28*).—Immunity studies, made with the tobacco viruses of ordinary mosaic, white mosaic, severe mosaic, ring spot necrosis, "Vorstenlanden distorting" strain I, and Holmes' distorting strain, indicated four types of antagonism—an equilibrium, a domination, a regulable equilibrium, and a partial overweighting. The rapidity of the antagonistic actions, the direction of virus movement, and the cell conditions in relation to immunity are also treated.

Stream double refraction of preparations of crystalline tobacco-mosaic protein, W. N. Takahashi and T. E. Rawlins (*Science, 85 (1937), No. 2195, pp. 103, 104*).—Previous work by the authors (E. S. R., 73, p. 332) suggested that tobacco-mosaic virus may be composed of submicroscopic rod-shaped particles capable of causing stream double refraction. In this study, from the University of California, crystal preparations made from infective juice by the Stanley method (E. S. R., 73, p. 800) and another method and colloidal solutions of the preparations containing the crystals produced stream double refraction. If the Stanley crystal preparations are pure virus, this behavior indicates that this virus is capable of causing stream double refraction and, when in colloidal solution, is probably composed of submicroscopic rod-shaped particles. Studies of the relation of pH to intensity of stream double refraction and to active virus concentration were made, as well as a comparison of the active virus concentration and intensity of stream double refraction in crystal preparations and in unpurified samples. If one assumes that the crystal preparations are pure virus, it follows from the results obtained that a significant portion of the virus in the crystals is inactive.

Precipitation of the tobacco mosaic virus complex at its isoelectric point, R. J. Best (*Austral. Jour. Expt. Biol. and Med. Sci., 14 (1936), No. 1, pp. 1–13, figs. 2*).—The virus of ordinary tobacco mosaic is precipitated from clarified juice of infected plants to various extents at from pH 3 to 4, the maximum occurring at pH 3.4. The precipitate, containing practically all of the virus, constitutes about 0.3 percent of the clarified juice or 3 percent of the total solids of the crude juice. The yield averages 2 mg per cubic centimeter of juice. Relatively stable colloidal solutions of the precipitate were obtained by eluting with buffer solutions at from pH 2.8 to 2.3 and from 4.5 to 7.5. From the evidence as a whole it is concluded that the precipitate constitutes the virus or a complex of the virus with some fundamentally related substance in the juice. Precipitation of the virus from suspensions of the "isoelectric" precipitate in buffer solution of pH 7 takes place in the same way as from the juice, the maximum being at pH 3.4. The juice of tomato plants artificially infected with the same virus behaved in the same way. The isoelectric point of the virus-complex may, therefore, be taken as pH 3.4 ± 0.1. The precipitate gave positive tests for protein, and desiccator-dried samples contained 14 percent nitrogen.

Interspecific transfer of a gene governing type of response to tobacco-mosaic infection, F. O. Holmes (*Phytopathology, 26 (1936), No. 10, pp. 1007–1014*).—A necrotic type of response to infection with tobacco-mosaic virus was introduced by crossing into the species *Nicotiana paniculata*. This was accomplished by transferring a dominant gene *N* (necrosis) from *N. rustica* through repeated backcrosses of the hybrid *N. paniculata*×*N. rustica*, using

N. paniculata pollen but retaining in each generation only individuals responding to inoculation by production of necrotic lesions. The necrotic type variety of *N. paniculata* thus produced was self-fertile and, in appearance, resembled the ordinary mottling type *N. paniculata*. In its response to infection, however, it was essentially like *N. rustica*, dying from systemic necrosis if infected when young, localizing virus if infected when old.

Genes affecting response of Nicotiana tabacum hybrids to tobacco-mosaic virus, F. O. Holmes (*Science, 85 (1937), No. 2195, pp. 104, 105*).—After transferring a dominant gene controlling necrotic response to tobacco virus 1, distorting strain, to a derivative of *N. paniculata* from *N. rustica* by hybridizing and backcrossing (as noted above), this gene was carried from the former to plants of [(*N. paniculata*×*N. tabacum*)×*N. tabacum*]×*N. tabacum*. A similar gene was transferred from *N. glutinosa* to three generations of hybrids with *N. tabacum*, but because of the sterility of the F_1 generation it was carried beyond this generation only by using *N. digluta*. The work is being continued in the hope of possibly incorporating these necrotic-type genes into strains of *N. tabacum* and producing varieties in which the virus would be unable to maintain itself.

The isolation of tobacco ring spot and other virus proteins by ultracentrifugation, W. M. Stanley and R. W. G. Wyckoff (*Science, 85 (1937), No. 2198, pp. 181–183*).—A high molecular weight crystalline protein, possessing the properties of ring spot virus and differing markedly from tobacco-mosaic virus protein in its physical, chemical, and serological properties, has been isolated by means of an ultracentrifuge from Turkish tobacco plants diseased with tobacco ring spot virus. Ultracentrifugal methods were also used to demonstrate that high molecular weight proteins are characteristic of other virus diseases. The concentration of the different virus proteins in the host was found to differ greatly, ranging from 1 part per 500 for tobacco mosaic, through latent mosaic and severe etch to ring spot, in which the virus protein occurs in about 1 part per 100,000, and to cucumber mosaic in which it may possibly occur in less than 1 part per million. The quantity ultracentrifuge, used in conjunction with an analytical ultracentrifuge, has proved to be a powerful tool for the concentration, purification, and crystallization of high molecular weight virus proteins, and to be indispensable in the case of unstable viruses existing in low concentration in the host.

Cabbage yellows presents a serious problem, O. A. Reinking (*Farm Res. [New York State Sta.], 3 (1937), No. 2, pp. 1, 2, 7, fig. 1*).—A general discussion of this fungus disease is given with special reference to New York State conditions, including references to losses caused, hosts, and resistant varieties.

Phytophthora root rot of cauliflower, C. M. Tompkins, C. M. Tucker, and M. W. Gardner (*Jour. Agr. Res. [U. S.], 53 (1936), No. 9, pp. 685–692, pl. 1, figs. 2*).—In this cooperative study by the California and Missouri Experiment Stations, it was found that a root rot of cauliflower due to *P megasperma* is responsible for losses in the winter cauliflower crop in the coastal districts of California. The disease occurs only where the soil has become waterlogged. It also occurs on cabbage, brussels sprouts, cineraria, and stock.

The outer leaves of infected cauliflower plants show a reddish discoloration, and later the plants wilt rather suddenly. Affected plants are easily pulled, and the basal end of the taproot is found to be rotted to such an extent that the cortex usually sloughs off. The cauliflower fungus is described and compared with isolates from certain other hosts.

Infection was obtained by adding the fungus to the soil of potted cauliflower plants and incubating them outdoors in buckets containing water about 4 in. deep. The incubation period was about 3 weeks. Infection was also obtained

by inoculations of stock, cineraria, and wallflower plants and of ripe tomato fruits. Attempts to infect certain other unwounded vegetables were unsuccessful.

Control of late blight of celery, J. K. Richardson (*Sci. Agr., 16 (1936), No. 7, pp. 358–364, figs. 3*).—These tests were undertaken to compare the effectiveness of certain fungicides in the control of late blight (*Septoria apii* and *S. apii-graveolentis*, the latter the more prevalent and the form here considered) under ordinary conditions in the Niagara Peninsula. Based on the results, the following recommendations are made:

A good copper fungicide should be used—either Burgandy (4–5–40) or bordeaux (4–4–40) mixtures as sprays or monohydrated copper sulfate plus lime (20–40) as a dust. Treatments should be thorough, with several applications before the seedlings are transplanted to the field, and at sufficiently short intervals to keep the new growth covered. Wherever possible, treatments should precede rainy periods. The dust should be applied while the dew is still on the plants. The copper-lime dust was less effective than the two sprays recommended. The sulfur sprays used and the copper carbonate-lime dust had very little value.

Diseases of hops [I], E. S. Salmon (*Jour. Inst. Brewing, 41 (1935), No. 6, pp. 235–237*).—A brief summary is given of the salient known facts.

Fungus and virus diseases of the hop, II, E. S. Salmon (*Jour. Inst. Brewing, 42 (1936), No. 4, pp. 184–186*).—A brief summary of the salient known facts.

Tomato sickness in Yorkshire, L. R. Johnson and H. W. Thompson (*Jour. Min. Agr. [Gt. Brit.], 43 (1936), No. 1, pp. 48–54, figs. 4*).—Records of tomato infestation with the nematode *Heterodera schachtii* in Great Britain are comparatively new and largely from Yorkshire. The symptoms are described as on the whole similar to those of potato sickness.

Experiments and observations of the past 7 yr., with special reference to greenhouse culture, appear to indicate the danger of planting tomatoes on potato-sick soil. Laboratory experiments showed that the potato strain can infest tomatoes. Control tests appeared to show that the only completely satisfactory method of soil treatment is that of steam sterilization.

A new disease of tomato [trans. title], R. Gigante (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 16 (1936), No. 3, pp. 183–198, pl. 1, figs. 14*).—The disease studied is characterized by leaf variegation and phloem necrosis. Thus far it has been transmitted only by grafting. It is believed to be of virus origin.

Pathogenicity tests with Botrytis spp. when inoculated into apples, O. F. Schnellhardt and F. D. Heald (*Phytopathology, 26 (1936), No. 8, pp. 786–794, figs. 3*).—In this contribution by the State College of Washington, gray mold is reported to cause a destructive apple rot in the State, advancing more rapidly than blue mold in storage and especially prevalent when high rainfall occurs during harvesting. Of the 19 species of *Botrytis* studied by inoculation tests, those of the *B. cinerea* type proved strongly parasitic, the others only weakly so. Recent isolations appeared to be more pathogenic than cultured strains.

Index to the relative susceptibility of orchard apples to cedar-apple rust, I. H. Crowell (*Phytopathology, 26 (1936), No. 5, pp. 459–461*).—Hitherto the relative susceptibility of orchard apples to cedar apple rust has been measured by visual observations or by counts of the number of lesions on the leaves. Since the prevalence of rust varies greatly in different orchards and seasons, the resulting measurements likewise vary. The author bases measurements of relative susceptibility on the number of aecia per lesion on apple leaves. This relatively constant phenomenon, based on the physiological reaction between

host and parasite, makes possible a classification of apple varieties independently of many major environmental variables.

Study scab resistance in apple varieties, W. O. Glover (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 2, p. 11*).—A brief progress report is given of 2 yr. of results in an apple scab variety test, using unsprayed orchard trees. Many varieties clearly must be protected by spraying, but a few are listed that appeared to be disease escaping.

A new disease of the apple, Y. Otsuka (*Jour. Hort. Assoc. Japan, 6* (*1935*), *No. 1, pp. 44–53, figs. 4*).—This disease is stated to have been known in Manchuria for some years, though not hitherto reported in the literature. About mid-June the affected fruit become darkened around the apical end and develop surface layers of cork in five more or less regular lines extending over the surface opposite each seed cell. Sometimes the entire fruit takes on a corky appearance and may even crack open. Affected fruits are also elongated and subnormal in size. Diseased branches grafted on healthy stock produced diseased fruit, while the other branches on the same tree developed normal fruit. It is still a question whether the disease is transmissible, and the author concludes that it is probably due chiefly to water loss from the fruit by transpiration.

Progress report on the investigation of a new peach disease, E. M. Stoddard (*Conn. Pomol. Soc. Proc., 44* (*1934*), *pp. 31–36*).—This contribution by the Connecticut [New Haven] Experiment Station reports the results of studies during 1934 relative to the "X" disease. Later results have been referred to (E. S. R., 76, p. 496).

The distribution, cause, and relative importance of cranberry fruit rots in Massachusetts in 1932 and 1933, and their control by spraying, H. F. Bergman and M. S. Wilcox (*Phytopathology, 26* (*1936*), *No. 7, pp. 656–664, figs. 2*).—Early rots caused the greater part of the spoilage of berries from unsprayed plats of a majority of five bogs investigated during 1932 and 1933, and *Glomerella*, *Sporonema*, and *Diaporthe* were the most important causes. *Sporonema* was much more important than has previously been reported. *Diaporthe* caused a loss of from 18 to 35 percent of the crop from several plats on one bog in 1933. The importance of any given fungus varied independently of that of the others, not only on different bogs but also on different parts of the same bog. A single application of 4–6–50 bordeaux mixture (made up with granular copper sulfate and chemically hydrated lime) was often ineffective and never so effective as were two. With one exception, two and three applications were beneficial on all bogs used in 1932 and 1933, although much variation in the degree of control was observed. In many instances two applications gave apparently as good control as three. Two mercurial sprays (phenyl mercury acetate and ethyl mercury arsenate) used on one bog in 1932 were fully as effective as bordeaux. With reference to the control of specific fungi by spraying, *Glomerella* and *Diaporthe* were controlled least, while *Sporonema* was effectively controlled by two or three applications. The failure to control rots in the Early Black variety by three applications of bordeaux on one bog in 1933 was probably due to the fact that the bog was reflooded early in June, prior to the first application.

Pocket atlas of the diseases of grapevines, O. Appel and A. Zschokke (*Taschenatlas der Krankheiten des Weinstockes. Berlin: Paul Parey, 1934, pp.* [*3*]+*25, pls. 24*).—This handbook consists of 24 colored plates, each with accompanying descriptive notes.

Factors concerned in the control of black rot of grape, T. F. Manns (*Peninsula Hort. Soc.* [*Del.*] *Trans., 49* (*1935*), *pp. 55–57*).—This contribution by the Delaware Experiment Station outlines briefly the results of demonstra-

tions and observations on black rot control during 1935. Cracking of the berries due to water pressure from excessive rains was severe, but it appeared to be somewhat checked by late disking or cultivation. Control of the black rot requires a properly timed program with thorough spraying, and a fish oil spreader is recommended for the applications just before and after blooming.

Second contribution to the study of court-noué of the vine [trans. title], J. BRANAS and G. BERNON (*Ann. École Natl. Agr. Montpellier, n. ser., 24 (1936), No. 1, pp. 15–56, figs. 2*).—It was found by these studies that at certain points in the annual growth cycle of the grapevine the content of tannin compounds in various organs (particularly the perennial ones) is higher in the court-noué than in the healthy vines. Whether these tannin substances play a direct or indirect causative role in court-noué or, more probably, are a host reaction to the disease are questions not yet to be answered definitely, but a study of the metabolic relations of the tannins in both normal and affected plants will undoubtedly aid in solving the problem.

Third contribution to the study of court-noué of the vine [trans. title], J. BRANAS and G. BERNON (*Rev. Vitic., 85 (1936), No. 2216, pp. 469–472*).—Continuing this series, the authors found the leaves of affected vines to be richer in glucides than those of healthy vines. This difference was especially induced by the gradual increase in the content of reducing sugars. The same conditions prevailed in the perennial organs as in the leaves.

Practical methods of disease control on avocado, D. F. PALMER (*Calif. Dept. Agr. Bul., 25 (1936), No. 2, pp. 260–269, figs. 5*).—Data are included for *Dothiorella*, tipburn, lime chlorosis, cankers, little leaf, sun blotch, and oak root fungus (*Armillaria mellea*).

Zinc relation in mottle-leaf of citrus, A. R. C. HAAS (*Bot. Gaz., 98 (1936), No. 1, pp. 65–86, figs. 7*).—In this study by the California Citrus Experiment Station with both healthy and mottled Valencia leaves the zinc treatment increased the number of leaves that rooted and fewer leaves died than among the controls. Although the average fresh weights of mottled orange leaves were less than in healthy leaves, such weights of the root systems of mottled leaves were greater. Zinc treatment benefited the rooting of healthy lemon leaves but failed to improve that of mottled leaves. Mottled leaf cuttings rooted as well as, if not better than, the healthy ones.

The leaves of mottled Valencia leafy-twig cuttings had lower fresh weights than those of the healthy cuttings but produced heavier root systems, and zinc treatment of the mottled cuttings increased the weights of fresh roots per gram of fresh leaves. Zinc treatment retarded the root growth of lemon leafy-twig cuttings, but the untreated mottled cuttings produced a higher fresh weight of roots than the healthy ones.

The various parts of untreated, rooted, mottled Valencia leafy-twig cuttings contained more sucrose than corresponding parts of nonmottled cuttings, but zinc treatment lowered the sucrose content of leaves and roots at the end of the test. The dry matter of mottled, field-grown leaves contained slightly more reducing and total sugars than the healthy leaves. This increased sugar content aids in a rapid recovery once the limiting condition is removed. In sand or soil cultures, an excess of urea, urea-calcium nitrate mixtures, cyanamide, dicyanamide, or arsenic induced partial chlorosis. With urea, little leaf was induced. Rooted cuttings grew well in culture solutions when phosphate was supplied for a few days at intervals of several weeks and when aluminum was present during the absence of phosphate.

For the first time mottle-leaf was produced in Valencia leaves of rooted leafy-twig cuttings in culture solutions, but thus far only in the absence of zinc or with low zinc concentrations under continuous high light intensities.

When zinc concentrations in the solution were somewhat excessive, the addition of aluminum affected growth beneficially. Zinc, when not too high in concentration, induced a dark-green color in the leaves.

By coating the leaf surfaces on rooted Valencia leafy-twig cuttings grown in culture solution with a mixture of zinc, the toxic effect or its temporary growth-inhibiting or retarding effect could be noted. Such effects may partially account for the variations frequently observed in the rate of response of trees to zinc applications.

Progress in zinc sulphate studies, A. F. Camp and W. Reuther (*Citrus Indus., 17 (1936), No. 3, pp. 12, 14*).—This contribution by the Florida Experiment Station is an address summarizing the authors' results in the use of zinc sulfate for the control of citrus mottle-leaf, with special reference to the time, amount, and character of the applications.

Xyloporosis, the new disease, its causes, and prevention, S. Baumgart (*Hadar, 9 (1936), No. 3, pp. 71–74, figs. 6*).—The "new disease" of limes is said to be due to disturbances in the circulation of the descending sap following mechanical injury of the stock in budding. Possible contributory factors are also mentioned.

Fungus diseases of feijoa [trans. title], G. V. Artem'ev (Artemiev) (*Sovet. Subtrop. (Soviet Subtrop.), No. 7 (1935), pp. 61–63, figs. 5*).—The pathogenic fungi described and briefly discussed include *Phyllosticta feijoicola*, *P. feijoae*, *Leptosphaeria feijoae*, *Mycosphaerella feijoae*, and *Phoma feijoae*, all new species.

The pineapple root system as affected by the root-knot nematode, G. H. Godfrey (*Phytopathology, 26 (1936), No. 5, pp. 408–428, figs. 5*).—The symptoms of root knot due to *Heterodera marioni* in pineapples are terminal and nonterminal galls in the main roots, brooming sometimes to several orders of branching, and very small rootlet galls. Large compound galls are not formed. Detailed symptoms change constantly owing to decay of old galls, development of new axillary roots, and the activities of other organisms. Soil infestation of at least 100 larvae within an inch of a root tip is necessary to produce a terminal gall on that root. General soil infestation of at least 172,800 larvae per cubic foot of soil is necessary to stop all the primary roots, and thus seriously to retard early growth. When the root system escapes this heavy, early infection, the plant can make a good start and may produce a fair crop of fruit. However, smaller scattered infections may gradually build up a large nematode population, resulting in abundant infection of new roots later in the life of the plant.

The drying up of the young branches of almonds in relation to some fungi [trans. title], A. Canonaco (*Riv. Patol. Veg., 26 (1936), No. 5–6, pp. 145–164, pl. 1, fig. 1*).—The author reports his study of an almond tree blight shown to be due to *Phomopsis amygdalina* n. sp.

Control practice for diseases and pests of ornamental plants, H. Pape (*Die Praxis der Bekämpfung von Krankheiten und Schädlingen der Zierpflanzen. Berlin: Paul Parey, 1936, 2. ed., rev., pp. VIII+427, pls. 8, figs. 303*).—In part 1 the author discusses the economic significance, causes, and methods of preventing and combating diseases and pests of ornamentals. In part 2, comprising the greater portion of the monograph, a section is devoted to the diseases and pests affecting many genera and species of ornamentals and a second and larger section to the diseases and pests of specific genera and species, arranged alphabetically according to host genera. The diseases include those due to fungi, bacteria, and higher plants, as well as those of nonparasitic origin, and the pests include insects and other noxious animals.

A bibliography of about five pages and an index complete the work.

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Ornamental flowering plants experimentally infected with curly top, J. H. Freitag and H. H. P. Severin (*Hilgardia [California Sta.], 10 (1936), No. 9, pp. 263–302, pls. 4, figs. 21*).—In cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, experimental transmission of the curly top virus is reported for 92 species of ornamental flowering plants, including 33 families and 73 genera. The various types of symptoms produced are described. Fifteen species failed to develop symptoms under greenhouse conditions. The life cycle of the leafhopper vector, *Eutettix tenellus*, was completed on 65 species.

Sources of disease-resistant vegetable and flower seeds, 1936, R. J. Haskell, V. R. Boswell, et al. (*U. S. Dept. Agr., Ext. Serv. and Bur. Plant Indus., 1936, pp. 41*).—This is a list of seed companies offering specified standard resistant varieties for sale in 1936 in the United States.

Injuries by the leaf spot disease of Cineraria [trans. title], H. Wasewitz (*Blumen u. Pflanzenbau ver. Gartenwelt, 40 (1936), No. 9, pp. 99, 100*).—In this note on attacks of *Cineraria* by *Ascochyta cinerariae*, the author briefly describes the symptoms and course of the disease and gives suggestions on its control.

The influence of different fertilizer treatments on the bactericidal and fungicidal action of aqueous extracts of Clematis recta [trans. title], G. Madaus and H. Schindler (*Biol. Zentbl., 56 (1936), No. 3–4, pp. 167–173, fig. 1*).—Aqueous extracts of *C. recta* variously fertilized (artificial fertilizer, leafmold, manure, and liquid manure) were tested for their effects on *Bacterium coli* [=*Escherichia coli*], *Aspergillus niger*, and *Oidium lactis*. The results indicated that the plants treated with the organic fertilizers were significantly more fungicidal and bactericidal than the controls or those treated with inorganic fertilizers.

Passion vine diseases, J. H. Simmonds (*Queensland Agr. Jour., 45 (1936), No. 4, pp. 322–330, figs. 8*).—This is a general discussion of the diseases of passionflower [*Passiflora* spp.] and their control in Queensland.

Privet and jasmine galls produced by a species of Phomopsis, N. A. Brown (*Phytopathology, 26 (1936), No. 8, pp. 795, 797–799, fig. 1*).—Galls observed on the common privet (*Ligustrum vulgare*) and on *Jasminum nudiflorum* in the southern United States were shown to be due to an apparently identical species of *Phomopsis*, since the two strains appeared similar and cross-inoculations were successful. Successful inoculations of the privet strain were also made on *L. amurense* and on the olive. Whether the fungus is a new species is as yet unknown.

Cytosporina ludibunda on American elm, J. C. Carter (*Phytopathology, 26 (1936), No. 8, pp. 805, 806*).—The prevalence of *C. ludibunda* was observed on wilting American elms in Illinois during the summers of 1934 and 1935, fruiting of the fungus occurring in the cankerous tissue. Successful inoculations were made with pure cultures of the fungus on potted American elms.

A second report on the status of the Dutch elm disease, G. R. Gage (*Jour. Tenn. Acad. Sci., 11 (1936), No. 2, p. 141*).—The status of the disease in four eastern areas is noted up to November 15, 1935.

Pseudolarix amabilis, a new host for Dasyscypha willkommii, J. A. Miller and K. F. Aldrich (*Science, 83 (1936), No. 2160, p. 499*).—Typical cankers occurred on this host in Massachusetts.

The bark canker of poplars [trans. title], W. Bavendamm (*Tharandter Forstl. Jahrb., 87 (1936), No. 2, pp. 177–179, fig. 1*).—This is a report of observations in Germany on a disease of young poplars—most severe on the more rapidly growing *Populus* spp.—due to *Dothichiza populea*, probably the pycnidial

form of *Cenangium populeum*. The disease is said to be very similar to a bark disease of oaks previously reported (E. S. R., 74, p. 805).

A new disease of Sitka spruce in Germany [trans. title], T. ROHDE (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 46 (1936), No. 6, pp. 277–284, figs. 8*).—The author describes and illustrates the symptoms of a new disease of Sitka spruce noted in two localities of the Province of Hannover, due to a new species of fungus, named by R. Kirschstein *Pezicula rohdeana*.

Effects on trees of an illuminating gas in the soil, C. G. DEUBER (*Plant Physiol., 11 (1936), No. 2, pp. 401–412*).—When from 5 to 10 cu. ft. of a coke-oven type illuminating gas were applied to the roots of elm trees no visible effects followed, but from 32 to 864 cu. ft. induced a variety of symptoms, chief among which were chlorosis and defoliation in the early stages, in some cases followed by drying out of the apical parts of the stems. Roots were also injured, and epinasty of leaves followed gassing when the soil surface was sealed. The lower buds were stimulated into active growth on stems defoliated by gassing. Before the beginning of the second growing season, 2 of the 20 treated trees died. Trees with their roots exposed to from 5 to 10 cu. ft. of gas showed no injuries the second season, but those exposed to from 46.2 to 864 cu. ft. showed dried distal parts of some stems or branches, with new, healthy shoots developing below, and with very little injury to the roots. It is suggested that ethylene or constituents of the gas with a physiological action similar to that of ethylene would explain the injurious, lethal, and stimulative effects obtained.

Studies on the wood-rotting fungus, Fomes pini.—II, Cultural characteristics, C. E. OWENS (*Amer. Jour. Bot., 23 (1936), No. 4, pp. 235–254, pls. 6, fig. 1*).—In this second contribution (E. S. R., 75, p. 654), an account is given of the cultural variations found among 80 isolates obtained from 6 genera and 19 species of coniferous trees. "The habit of growth of *F. pini* on *Abies grandis* and the cultural characters of isolates from this host species indicate that the variant of the fungus occurring on this host is distinct from that on species of *Pinus*, *Pseudotsuga*, *Tsuga*, *Picea*, and *Larix*, and from that on some other species of *Abies*. On account of lack of material from the European and New England species of *Abies* and *Picea* for critical study, no statement is ventured as to whether the form which the writer studied on *A. grandis* is identical with *F. pini* (Thore) Lloyd var. *abietis* Karst."

The influence of fungal decay on the properties of timber.—I, The effect of progressive decay by Polyporus hispidus, Fr., on the strength of English ash (Fraxinus excelsior, L), K. ST. G. CARTWRIGHT, W. G. CAMPBELL, and F. H. ARMSTRONG (*Roy. Soc. [London], Proc., Ser. B, 120 (1936), No. 816, pp. 76–95, figs. 9*).—Parallel series of mechanical tests and chemical analyses indicated that the bending strength is affected immediately by fungus infection, but that the elasticity or stiffness is only slightly impaired in the early stages. The loss in crushing strength was small and gradual throughout the period of exposure to decay. Attention is called to the serious reduction in toughness of ash wood caused by *P. hispidus*, even during the early stages of attack when the decay is still undetectable.

The chemistry of the white rots of wood.—IV, The effect on wood substance of Ustulina vulgaris Tul., W. G. CAMPBELL and J. WIERTELAK (*Biochem. Jour., 29 (1935), No. 6, pp. 1318–1321*).—Continuing these studies (E. S. R., 71, p. 741), it was found that *U. vulgaris* induces in wood of linden (*Tilia vulgaris*) a type of decomposition characterized as white rot. Its chief nutrient is the carbohydrate part of the cell wall, but lignin is also decomposed to some extent. Its saprophytic action on beechwood is slow but chemically of

the same order as its parasitic action. The experimental data from decayed linden wood suggest that this fungus must be highly detrimental to the mechanical properties of the wood.

Stimulated activity of natural enemies of nematodes, M. B. Linford (*Science, 85 (1937), No. 2196, pp. 123, 124*).—In recent studies over 20 nema-destroying species of fungi have been recognized in Hawaiian soils, some apparently identical with forms described by Drechsler (E. S. R., 76, p. 650) and others elsewhere. Many were found to destroy larvae of the root knot nematode *Heterodera marioni*, although not to the extent of extermination. Laboratory and glasshouse experiments are reported whereby increased activity of these fungi was induced by the incorporation of fresh pineapple plant material into soils, accompanied within 3 weeks by striking reductions in larval populations. Similar reductions occurred in soil treated with applications of grass at the rate of 165 tons per acre-foot.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology and helminthology by the Hawaii Station] (*Hawaii Sta. Rpt. 1936, pp. 12, 13, 14, 79–92, figs. 4*).—Reporting for the year the work referred to includes poultry parasites, namely, the gizzard worm *Cheilospirura hamulosa* of chickens and turkeys, particularly the finding of new intermediate hosts in 14 different species of arthropods, and intermediate hosts of other parasites of chickens in Hawaii, including the spiral stomach worm *Dispharynx spiralis*, the globular stomach worm *Tetrameres americana*, the eye worm *Oxyspirura mansoni*, and a tapeworm (*Hymenolepis exigua*) not previously reported from Hawaii, etc., and parasites of pigs and horses, all by J. E. Alicata; the liver fluke of cattle, *Fasciola gigantica*, including a survey which has shown it to be widespread in the Islands, slaughterhouse reports of beef cattle, methods used for its control, and field experiments now in progress, by L. E. Swanson; species of liver fluke found in Hawaii (*F. gigantica*), by Alicata and Swanson; life history of *F. hepatica* and silage as a possible means of killing liver fluke larvae encysted on grass, both by Alicata; and rodent control.

[Work in economic zoology, entomology, and limnology by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 88, 89, 100–107, 134*).—The work of the year referred to (E. S. R., 74, pp. 809, 811) included the nutritional requirements of trout, by C. M. McCay and A. V. Tunison; rations for mink, by L. A. Maynard and A. Z. Hodson; the alfalfa snout beetle *Brachyrhinus ligustici* L. and its control, by P. W. Claassen and C. E. Palm (E. S. R., 76, p. 368); control of white grubs, by Palm; Dutch elm disease and the lesser European elm bark beetle, by P. A. Readio, D. L. Collins, D. S. Welch, K. G. Parker, and L. J. Tyler; insects attacking potatoes on Long Island, by G. F. MacLeod and W. Dickison; millepede and gnat injuries to potato tubers, by MacLeod and F. G. Butcher; wireworms and their injuries to potato tubers, by MacLeod and W. A. Rawlins; muck land potato spraying experiments, by MacLeod and H. Menusan, Jr.; onion thrips, by MacLeod and F. G. Maughan; insects attacking turf and ornamental plantings, by MacLeod and K. E. Maxwell; the onion maggot, sulfur as an insecticide, reactions of insects to radiant energy, and insect vectors of virus diseases, all by MacLeod; biology and control of the two common clothes moths, the columbine borer and the iris borer, and insects injurious to leaves and blossoms of plants in the flower garden, all by G. H. Griswold; fur resources of New York, by W. J. Hamilton, Jr.; weight-length relationship in fishes, by G. C. Embody and P. I. Tack; control of fish

hatchery diseases, by Embody, S. M. Brown, A. M. Phillips, and Tack; feeding experiments with young bass, by Embody; and artificial incubation of game birds' eggs, by A. L. Romanoff.

A new technique for producing lesions of the encephalon cortex, C. W. Brown, F. M. Henry, and E. E. Ghiselli (*Science, 84 (1936), No. 2175, pp. 232, 233*).—A description of a new technic employed at the University of California, accompanied by references to the literature.

[The progress of research work with game in New York State] (*N. Y. State Conserv. Dept. Ann. Rpt., 25 (1935), pp. 319–357, fig. 1*).—Research work for the year here reported (E. S. R., 74, p. 365) deals particularly with that relating to ruffed grouse, pheasant, and quail.

Wild life research in Wisconsin, A. Leopold (*Wis. Acad. Sci., Arts, and Letters, Trans., 29 (1935), pp. 203–208*).—A review of the progress of wildlife research in Wisconsin, presented with a list of 11 references to the literature.

The fox in captivity (*Ontario Dept. Game and Fisheries Bul. 7 [1936], pp. [3]+161, pl. 1, figs. 35*).—The several chapters of this handbook deal with the principles of ranch construction, feeds and feeding, practical breeding and selection of breeding stock, reproduction, preparation of pelts, parasitic diseases, diseases of the digestive tract, kidney diseases, distemper, and miscellaneous conditions.

Seasonal food of skunks in New York, W. J. Hamilton, Jr. (*Jour. Mammal., 17 (1936), No. 3, pp. 240–246*).—Some 3,000 analyses of the visceral contents of skunks, more than one-half of which were the eastern form (*Mephitis nigra*), collected during a period of 9 yr. commencing in 1927 from trappers and fur buyers are reported upon, the details being given in three tables.

Bioassays of rodenticides, J. C. Munch, F. E. Garlough, and J. C. Ward (*Jour. Amer. Pharm. Assoc., 25 (1936), No. 9, pp. 744–746*).—In the discussion of this subject it is pointed out that bio-assays of rodenticides are necessary, since chemical assays often fail to indicate their physiological activities.

Game birds of prairie, forest, and tundra, A. Wetmore (*Natl. Geogr. Mag., 70 (1936), No. 4, pp. 461–500, pls. 16, figs. 5*).—This is the fifteenth of the series of articles describing the bird families of the United States and Canada, illustrated by paintings by A. Brooks (E. S. R., 76, p. 63).

The birds of Nevada, J. M. Linsdale (*Cooper Ornithol. Club, Pacific Coast Avifauna, No. 23 (1936), pp. 145, fig. 1*).—A total of 338 species and subspecies of birds known to occur in Nevada, based upon the field work of 80 observers in the State from 1867 to 1935, inclusive, are recognized. In addition to the accounts of these forms, which take up the greater part of the work (pp. 27–133), the author considers the physiography of the State, presents an historical summary, refers to the field workers, and gives a list of localities, a check list of the birds, a hypothetical list, and a list of the literature cited.

Winter food of the sharp-tailed grouse and pinnated grouse in Wisconsin, F. J. W. Schmidt (*Wilson Bul., 48 (1936), No. 3, pp. 186–203, figs. 3*).—This contribution deals with the winter food only, based upon observations (1) at winter feeding stations and grain food patches, (2) of migrant prairie chickens on their wintering grounds, (3) of grouse budding in trees, (4) made by backtracking flushed grouse, (5) of artificial feeding of grouse in pens, and (6) of the crop contents of 19 grouse collected during the winter. The dietaries of the prairie sharp-tailed grouse (*Pedioecetes phasianellus campestris*) and the greater prairie chicken or pinnated grouse (*Tympanuchus cupido americanus*) overlap but are nevertheless essentially different, the former being a northern bird that extends into Wisconsin from the northwest while the latter is a more southern bird extending into Wisconsin from the south. The winter food habits

of the two species are discussed separately, from the standpoint of grouse management, with special reference to the question of how much, if any, grain and cultivated weed seed is necessary, and at what seasons. The palatability sequence of winter foods for the prairie sharp-tailed grouse, northern sharp-tailed grouse, pinnated grouse, and the ruffed grouse is summarized in a table.

Food habits of marsh hawks in the glaciated prairie region of north-central United States, P. L. Errington and W. J. Breckenridge (*Amer. Midland Nat., 17 (1936), No. 5, pp. 831–848*).—The results of studies by the Iowa Experiment Station of the food habits of the marsh hawk (*Circus hudsonius* (L.)) in the glaciated prairie agricultural region during the summers of 1933, 1934, and 1935 are presented in detail in four tables. The food habits of the marsh hawk in late summer, fall, winter, and spring, its adaptations for securing prey, and its pressure upon prey populations are dealt with. A thousand individuals of vertebrate prey taken by the marsh hawks hunting in Iowa, Minnesota, and Wisconsin were identified.

"The marsh hawk, in common with most other predators, seems to feed chiefly upon whatever it finds conveniently available as food, whether that food be carrion (of fresher grades) or captured prey. The carrion eaten is represented in large measure by carcasses of animals killed along highways by motor traffic; the prey, by young rabbits, mice, the smaller ground squirrels, passerine birds, and young or crippled individuals of larger species, including ring-necked pheasants.

"From the findings of intensive studies of vertebrate populations, it is becoming increasingly apparent that the role of predation in determining population levels of prey species may be of far less consequence on the whole than has been previously believed. A great deal of the pressure of predators—that of marsh hawks included—seems to be centered upon those proportions of the prey populations that tend to exceed the capacities for accommodation of their respective habitats."

A list is given of 29 references to the literature.

The ring-necked pheasant as a nesting parasite of other game birds, L. J. Bennett (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 373–375*).—In a study in 1934 by the U. S. D. A. Bureau of Biological Survey and the Iowa Experiment Station cooperating, approximately 4.7 percent of the puddle duck nests in the prairie area of Iowa were found parasitized by the ring-necked pheasant. The pheasant eggs deposited in duck nests apparently reduced the potential number of duck eggs. A small percentage of pheasant eggs deposited in duck nests hatched. There is no apparent strife between nesting ducks and nesting pheasants. A small percentage of king rail nests, Virginia rail nests, and European partridge nests is parasitized by pheasants.

The waterfowl situation, F. C. Lincoln (*Bul. N. Y. Zool. Soc., 39 (1936), No. 5, pp. 184–193, figs. 10*).—A discussion of the waterfowl situation, contributed from the U. S. D. A. Bureau of Biological Survey.

The Pacific rattlesnake, C. T. Vorhies (*Calif. State Dept. Pub. Health Weekly Bul., 15 (1936), Nos. 21, pp. 81–83; 22, pp. 86, 87*).—This is a practical account of *Crotalus confluentus oreganus*.

The amphipod Orchestia platensis an intermediate host for Hymenolepis exigua, a tapeworm of chickens in Hawaii, J. E. Alicata (*Jour. Parasitol., 22 (1936), No. 5, pp. 515, 516, fig. 1*).—During the course of a study of several invertebrates collected from various poultry farms near Honolulu the author discovered that the amphipod *O. platensis* was frequently parasitized by many cysticercoids. Upon infestation of day-old chicks that were killed at 3 weeks of age, these proved to be *H. exigua*, a tapeworm of chickens in Hawaii.

Earthworms as transmitters of Capillaria annulata, the "crop-worm" of chickens, E. E. WEHR (*North Amer. Vet., 17 (1936), No. 8, pp. 18–20, fig. 1*).—It is concluded from natural and experimental ingestion of infested earthworms by chickens and the identification of larvae that *C. annulata* utilizes earthworms (*Helodrilus foetidus* and *H. caliginosus*) as intermediate hosts. It is pointed out that this unexpected finding clearly indicates the necessity for revising current ideas as to the life histories of nematodes of the suborder Trichurata.

The senses involved in the courtship of some vagabond spiders, B. J. KASTON (*Ent. Amer., n. ser., 16 (1936), No. 2, pp. 97–166, figs. 23*).—A contribution from the Connecticut [New Haven] Experiment Station.

Insect metabolism at temperatures below zero, I. V. KOŽANČIKOV (KOZHANTSCHIKOV) (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 3 (1935), No. 8, pp. 373–376, fig. 1*).—The results of work with the European corn borer and the beet webworm are reported upon.

The occurrence of insects at some height in the air, especially on the roofs of high buildings, E. P. FELT and K. F. CHAMBERLAIN (*N. Y. State Mus. Circ. 17 (1935), pp. 70, figs. 4*).—An annotated list is given of the insects and spiders collected during the season of 1927 on the roof of a high building in each of several localities, including Albany, New York City, and Mount Vernon, and in the observation rooms of the fire towers at Athol (Warren Co.) and Stephentown (Rensselaer Co.), N. Y. A description is given of the collecting sites and a summary and discussion of the results of the work in which approximately 1,000 different species representing a wide variety of groups were captured. Among these were some 25 species previously unknown from New York State, 1 species (*Oxythrips ajugae* Uzel) not previously recognized in North America, and representatives of 2 new genera.

Aberrant feeding behavior among insects and its bearing on the development of specialized food habits, C. T. BRUES (*Quart. Rev. Biol., 11 (1936), No. 3, pp. 305–319, fig. 1*).—This contribution is accompanied by a four-page classified list of references to the literature.

[Contributions on economic insects and their control] (*Peninsula Hort. Soc. [Del.] Trans., 48 (1934), pp. 12–19, 30–44, figs. 6; 49 (1935), pp. 31–39, 61–64, 86–102, fig. 1*).—Contributions relating to fruit insects, particularly the codling moth, and their control presented at the December 1934 meeting of the Peninsula Horticultural Society (E. S. R., 71, p. 666) include the following: Results of Experiments With Non-arsenicals for Codling Moth Control, by W. S. Hough (pp. 12–14), contributed from the Virginia Experiment Station; Codling Moth Problem on the Eastern Shore, by E. N. Cory (pp. 15–19); and An Examination of the Factors Determining Spraying and Other Recommendations for Control of the More Important Insect Pests of Apple, Peach, and Grape During the Five-Year Period 1930–1934, by L. A. Stearns (pp. 30–44), contributed from the Delaware Experiment Station.

Those presented at the December 1935 meeting include Present Status of the Rosy Apple Aphid and Its Control in Virginia Orchards, by W. S. Hough (pp. 31–34), contributed from the Virginia Experiment Station; Codling Moth Situation, by E. N. Cory (pp. 35, 36); Experiments on the Control of the Mexican Bean Beetle, by G. S. Langford and S. L. Crosthwait (pp. 37–39); Corn Borers, by L. P. Ditman (pp. 61–64), contributed from the Maryland Experiment Station; and Control of the Lesser Peach Borer, by H. G. Guy (pp. 86–88), Notes on the Ragweed Borer *Epiblema strenuana* Walk. and Its Parasites, by P. L. Rice (pp. 89–94), and Results of Experimental Spraying During 1935 for Control of Codling Moth, by L. A. Stearns, P. L. Rice, and H. G. Guy (pp. 95–102), all contributed from the Delaware Experiment Station.

[Report of work in entomology by the West Virginia Station] (*West Virginia Sta. Bul. 278 (1936), pp. 28–30*).—The work of the biennium 1935–36 briefly referred to (E. S. R., 72, p. 654) includes the use of insecticides and bands for control of the codling moth, search for more convenient treatments for control of the pistol casebearer, and progress of a study of the relation of temperature to insect development.

[Contributions on economic insects and their control] (*Ohio Veg. Growers Assoc. Proc., 20 (1935), pp. 21–25, 27–34, 130, 132, 134, 136*).—Contributions here presented (E. S. R., 73, p. 505) include the following: Derris for the Control of Certain Vegetable Insects, by N. F. Howard, H. C. Mason, and R. H. Davidson (pp. 21–25); and The Tomato Fruit Worm [Corn Earworm] Problem, by J. S. Houser (pp. 27–34), and Controlling Insects on Muck Crops, by J. P. Sleesman (pp. 130, 132, 134, 136), both contributed from the Ohio Experiment Station.

[Report of work in entomology] (*California Sta. [Bien.] Rpt. 1935–36, pp. 84–90*).—The work of the biennium 1935–36 referred to (E. S. R., 72, p. 654) includes control of insect pests by parasites, improvements in tank-mix oil sprays for citrus (E. S. R., 75, p. 666), cyanide fumigation of citrus and avocados, citrus red mite control by Selocide (E. S. R., 75, p. 234) and by dinitro-*o*-cyclohexylphenol (E. S. R., 75, p. 224), the codling moth on walnuts (E. S. R., 74, p. 522), codling moth control program for pears, a tomato insect survey, spray residues from Selocide, light traps (E. S. R., 73, p. 509), and bean and pear thrips control.

Report on the entomological section for the year ending March 31st, 1936, R. W. E. TUCKER (*Agr. Jour. [Barbados], 5 (1936), No. 2, pp. 67–75, fig. 1*).—This report (E. S. R., 74, p. 513) relates particularly to the rearing and release of *Lixophaga diatraeae* parasites of the sugarcane borer, the details of a survey of which are given in a table.

Recent entomological investigations, [I], II, F. A. SQUIRE (*Agr. Jour. Brit. Guiana, 6 (1935), No. 2–3, pp. 84–90, figs. 2; 7 (1936), No. 1, pp. 21–26, pls. 2*).—The first part of this contribution reports upon the hardness of rice made in the course of an investigation of the rice weevil and gives a list of additions to the entomological collection; part 2 presents an account of the plantain and banana beetle *Colaspis hypochlora* Lefèv. (pp. 21–24), followed by a brief contribution on field studies of the parasitism of the egg of the coconut caterpillar *Brassolis sophorae* L. by *Telenomus nigrocoxalis* Ashm. and of the pupa by *Chalcis annulata* and *Spilochalcis brassolis*.

[Work in entomology at the Rothamsted Experimental Station] (*Rothamsted Expt. Sta., Harpenden, Rpt., 1935, pp. 58–66, 80–82*).—The work of the year, including that with insecticides and beekeeping, together with a list of the contributions on bees published by the station from 1926 to 1935, inclusive, and the occurrence of insect pests at Rothamsted and Woburn in 1935 by A. C. Evans, are reported upon.

Injurious insects of Cyprus, H. M. MORRIS (*Cyprus Agr. Jour., 31 (1936), Nos. 1, pp. 9–11; 2, pp. 58–64; 3, pp. 83–93; 4, pp. 125–132*).—A brief report on the insects of economic importance in Cyprus.

Some insect pests recorded from the mandated Territory of New Guinea, J. L. FROGGATT (*New Guinea Agr. Gaz., 2 (1936), No. 1, pp. 15–18*).—Insect pests recorded from the Territory of New Guinea are listed according to hosts attacked.

The control of injurious insects, E. RONCORONI (*La lotta contro insetti dannosi. Varese: Tipog. Arc. Addolorata, 1935, pp. 263+[10], pls. 43, figs. 35*).—Following a general account, this contribution deals with some of the more important insects met with in the Province of Varese, particularly cockchafers (*Melolontha* spp.) and the pine processionary *Thaumetopoea pityocampa*.

Relative toxicity of pyrethrins I and II to insects, A. HARTZELL and F. WILCOXON (*Contrib. Boyce Thompson Inst., 8 (1936), No. 3, pp. 183–188, fig. 1*).—The possibility that discrepancies in the findings of various investigators as to the relative toxicity of pyrenthrins I and II might be due either to different susceptibilities in the insects used or differences in the physical state of the pyrethrins at the moment of application led to the experiments here reported.

"A partial separation of pyrethrins I and II was effected by multiple extraction, using as solvents petroleum ether and aqueous acetic acid. Extracts were obtained in which the ratio of I to II varied from 4 to 0.047 according to the Seil method of analysis. The comparative toxicity of pyrethrum extracts varying in ratio of pyrethrins I and II was determined on *Aphis rumicis*, using acetone and a miscible oil as solvents for the pyrethrins with water. When extracts high in pyrethrin I were compared with extracts high in pyrethrin II, using acetone as a solvent, the pyrethrin I extracts were considerably more toxic than extracts high in pyrethrin II. When a miscible oil such as Penetrol was used as a solvent the difference in toxicity tended to disappear. When similar extracts were tested on houseflies (*Musca domestica*), by means of both the Peet-Grady method and a modified Nelson method, the differences obtained in the toxicity of extracts high in pyrethrin I and extracts high in pyrethrin II were not statistically significant. The results indicate that the physical condition of the pyrethrins at the time of application is a determining factor in the relative toxicity at least so far as *A. rumicis* and *M. domestica* are concerned. The relative toxicity of pyrethrins I and II depends almost entirely upon the method of application used."

Investigations on the insect and allied pests of cultivated mushrooms, IV, V, M. D. AUSTIN and S. G. JARY (*Jour. Southeast. Agr. Col., Wye, Kent, No. 36 (1935), pp. 103–110*).—The fourth part of this contribution (E. S. R., 72, p. 502) considers the natural fauna of stable manure used in the preparation of mushroom beds (pp. 103–106), and the fifth part reports experiments on the control of flies and mites (pp. 107–110). Sprays containing nicotine (98 percent) at a dilution of 1:1,600 were not effective in killing eggs of *Sciara fenestralis*, and the addition of sulfonated lorol, 1:4,000, did not increase the efficiency of the spray. "Larvae of *S. fenestralis* were somewhat affected by nicotine sprays, but under the most favorable experimental conditions a mortality of only 60 percent was obtained. Under commercial conditions a much lower mortality would be expected. In mushroom houses nicotine sprays are only effective against adult flies, and spraying should therefore be done frequently as a matter of routine to prevent a large population of adult flies accumulating. Solutions of common salt at a dilution of 1:160 showed no toxicity toward larvae of *S. fenestralis*. Two wetting agents, sulfonated lorol and sodium γ sulfonate, at dilutions of 1:2,000, were harmless when applied as sprays on growing mushrooms. A proprietary oil emulsion when carefully mixed and lightly sprayed on growing mushrooms checked the injury caused by tyroglyphid mites. A light application when the temperature of the liquid was 104° F. produced no injury to mushrooms. Warm water applied at a temperature of 110° also caused no injury to mushrooms."

Control of tobacco insects in Tennessee, S. MARCOVITCH and W. W. STANLEY (*Tennessee Sta. Bul. 160 (1937), pp. 14, figs. 17*).—A practical summary is given of control measures under Tennessee conditions. Of the insecticides tested by the station, the fluorine compounds are said to have come nearer to meeting the requirements than any of the materials that have been commonly used.

[Contributions on orchard insect pests] (*Ind. Hort. Soc. Trans., 1934, pp. 32–49, 62–82; 1935, pp. 29–67, 139–142, fig. 1*).—Contributions presented at the

seventy-fourth annual meeting of the Indiana Horticultural Society (E. S. R., 72, p. 216), held in January 1935, related particularly to the codling moth and its control, including the following: Pruning As an Aid in Codling Moth Control, by M. McCown (pp. 32, 33); The Value of Supplementary Measures in the Codling Moth Control Program, by L. F. Steiner, A. J. Ackerman, and D. W. Hamilton (pp. 34–40); Present Status of Chemically Treated Bands for Use in Codling Moth Control, by G. E. Marshall (pp. 41–43), Residue Loads Resulting From First and Second Brood Sprays, by C. L. Burkholder (pp. 45–47), and 1934 Codling Moth Spray Tests, by G. E. Marshall (pp. 62–65), all contributed from the Indiana Experiment Station; Insecticide Tests to Control the Codling Moth at the Vincennes, Indiana, Laboratory During 1934, by L. F. Steiner, R. F. Sazama, and J. E. Fahey (pp. 66–71); and The Significance of Supplementing Controls in Combating the Codling Moth, by J. J. Davis (pp. 72–82), contributed from the Indiana Experiment Station.

The contributions presented at the meeting held in January 1936 include the following: Notes on Codling Moth Control in New Jersey, by B. F. Driggers (pp. 29–36), contributed from the New Jersey Experiment Stations; The Relative Efficiency of Certain Lead Arsenate Spray Treatments, by L. F. Steiner, R. F. Sazama, J. E. Fahey, and H. W. Rusk (pp. 38–43); and Trends in Orchard Insect Problems, by J. J. Davis (pp. 53–56), The Results of 1935 Codling Moth Control Experiments, by G. E. Marshall (pp. 56–64), and The Cost of Controlling Apple Insects and Diseases, With Special Reference to the Codling Moth, by M. S. Troth and G. E. Marshall (pp. 139–142) (E. S. R., 73, p. 809), all from the Indiana Experiment Station.

[Contributions on orchard fruit insects and their control] (*Conn. Pomol. Soc. Proc., 44 (1934), pp. 24–26, 26, 27, 82–88, 89–93, 94–106*).—Among the contributions presented (E. S. R., 72, p. 215) at the 1934 meeting of the Connecticut Pomological Society are the following: The Oriental Peach [Fruit] Moth Parasite Situation (pp. 24–26) and Control of Orchard Pests (pp. 82–88), both by P. Garman, contributed from the Connecticut [New Haven] Experiment Station; and The Fruit Tree Leafroller, by P. J. Chapman (pp. 89–93), and Apple Pest Control With Special Reference to Tar Oil Sprays, by F. Z. Hartzell (pp. 94–105), both contributed from the New York State Experiment Station. A brief report of the parasite distribution committee of the society for 1934, by H. M. Rogers et al., is also presented (pp. 26, 27).

The proceedings for the 1935 meeting have been noted (E. S. R., 76, p. 64).

Dormant oil sprays for apple pests, F. Z. Hartzell (*Farm Res. [New York State Sta.], 3 (1937), No. 2, p. 9*).—This contribution, based upon work noted above and previously (E. S. R., 75, pp. 375, 665), relates to tests of coal tar oil, coal tar oil with lubricating oil, and a new "DN" oil spray in an effort to control the rosy apple aphid, eye-spotted budmoth, and certain scale insects with one application.

[Control work with the white pine weevil and the gypsy moth in New York State] (*N. Y. State Conserv. Dept. Ann. Rpt., 25 (1935), pp. 85, 123–130, fig. 1*).—Reference is made to the progress of control work with the white pine weevil (p. 85) and the gypsy moth (pp. 123–128, 129, 130).

The biology of Pseudosinella violenta (Folsom), with some effects of temperature and humidity on its life stages (Collembola: Entomobryidae), R. Davis and H. M. Harris (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 421–428, pl. 1, figs. 6*).—In reporting upon stages of the biology of *P. violenta*, one of the commonest springtails met with in Iowa, a description is given of a special technic devised for handling small soft-bodied insects.

Fighting grasshoppers on Illinois farms, J. H. Bigger, W. P. Flint, and M. D. Farrar (*Illinois Sta. Circ. 466 (1937), pp. 11, figs. 4*).—A practical contri-

bution on grasshoppers of Illinois, in which State three, namely, the differential grasshopper, the lesser migratory locust *Melanoplus mexicanus* Sauss. or *M. atlanis* Riley, and the red-legged grasshopper, are responsible for nearly all the damage, together with means for their control.

Research on termites in the United States, T. E. SNYDER (*Amer. Wood-Preservers' Assoc. Proc., 32 (1936), pp. 302–309, figs. 4*).—This contribution was presented at the annual meeting of the American Wood-Preservers' Association held in Memphis, Tenn., in January 1936.

Report on certain dusts tested against citrus thrips on oranges, E. A. MCGREGOR (*Calif. Citrogr., 21 (1936), No. 11, p. 436*).—In the experimental application of dusts for control of the citrus thrips in California in 1934 and 1935, barium fluosilicate without sulfur was of little value, but when combined with 70 percent of sulfur the mixture gave a marked reduction of thrips damage. "Powdered derris and talc in 2 orchards gave indicated reductions of thrips damage amounting respectively to 45 and 84 percent. Such results are not promising. Pyrethrum and talc gave an indicated reduction of thrips injury amounting to 54 percent, which again is unsatisfactory. A dust containing 0.19 percent of pyrethrins and 44.1 percent sulfur resulted in 95 percent reduction in thrips damage. This high protection was doubtless due in large part to the sulfur. A dust combining rotenone 0.5 percent (in the form of derris dust) and sulfur dust 50 percent reduced thrips damage to the extent of 96 percent. Again the effectiveness was attributable in large measure to the sulfur in the mixture.

"Six different dusts containing zinc compounds equivalent to 4.25 to 17 percent zinc were applied in 1934 and 1935 in 11 orchard tests. The sulfur content of these dusts ranged from 27 to 84 percent. The reduction in thrips damage, following the use of these zinc-containing dusts, ranged from 78 to 100 percent. The average amount of thrips-damaged fruit in the series of plats treated with the zinc-sulfur dusts was only 4.8 percent. The foregoing data indicate that the addition of zinc compounds to the sulfur dusts does not noticeably lessen their effectiveness for control of the thrips."

See also a previous note (E. S. R., 72, p. 219).

Our knowledge of California Thysanoptera previous to 1900, S. F. BAILEY (*Pan-Pacific Ent., 12 (1936), No. 3, pp. 97–103*).—This is a discussion of the early knowledge of the Thysanoptera in California, presented with a list of 10 references to the literature.

On some Thysanoptera collected in France, R. S. BAGNALL and O. JOHN (*Ann. Soc. Ent. France, 104 (1935), No. 3–4, pp. 307–327*).—An annotated catalog of 209 forms of Thysanoptera collected by the authors in France.

The insecticidal action of acid lead arsenate on the larvae of the Japanese beetle in different types of soil, W. E. FLEMING, F. E. BAKER, and L. KOBLITSKY (*Jour. Agr. Res. [U. S.], 53 (1936), No. 10, pp. 771–779*).—In continuation of previous work (E. S. R., 75, p. 523), the authors report upon a study of the effectiveness of acid lead arsenate against larvae of the Japanese beetle in 15 types of New Jersey soil. The coefficient of insecticidal action ranged from 0.3 in Colts Neck loam to 2.18 in Lakewood sand. The difference in the action of acid lead arsenate appeared to be associated with some intrinsic property of the soils. There was no correlation between the coefficient of insecticidal effectiveness and the total nitrogen, phosphates, potassium, calcium, magnesium, and carbon in the soils. The water-soluble constituents accounted for 77 percent of the variance in the insecticidal action. The concentrations of water-soluble phosphates, calcium, and magnesium appear to be the most important factors influencing the effectiveness of acid lead arsenate. The greater the concentrations of soluble phosphates and calcium in the soil when

acid lead arsenate is applied, the more effective it is, and the greater the concentration of soluble magnesium the less effective it is. The influence of soluble chlorides, manganese, nitrates, ammonia, and potassium in the soil on insecticidal action is of minor importance. Although the pH is a minor factor, the nature of the radicals producing the acidity or alkalinity being more important, it is apparent the acid lead arsenate is generally more effective in acid than in alkaline soils.

An annotated list of the Lepturini of Oregon, M. F. CANOVA (*Pan-Pacific Ent., 12 (1936), No. 3, pp. 126–132*).—A systematic list with locality records of members of the cerambycid tribe Lepturini in Oregon.

The elaterid beetles of the Philippine Islands, R. H. VAN ZWALUWENBURG (*Philippine Jour. Sci., 59 (1936), No. 3, pp. 393–432*).—In this contribution from the Hawaiian Sugar Planters' Experiment Station, the author lists some 204 species and 11 varieties of elaterid beetles occurring in the Philippines and gives locality records of their occurrence. Of the forms listed one species is described as new.

The sisal weevil, W. V. HARRIS (*East African Agr. Jour., 2 (1936), No. 2, pp. 114–126, figs. 9*).—An account is given of *Scyphorphorus acupunctatus* Gyll., a weevil which attacks young sisal plants, weak plants, and plants which have flowered, breeding particularly in the plant base. This pest of sisal in the Province of Tanga, Tanganyika, where it was apparently introduced with its host plant from its original home in Central America, requires from 50 to 95 days for the completion of its life cycle. Factors influencing the number of beetles present are discussed and control measures suggested.

Observations on some Hemiptera attacking the cotton plant [trans. title], J. V. LEROY (*Inst. Natl. Étude Agron. Congo Belge Pubs., Sér. Sci., No. 10 (1936), pp. 20, pls. 24*).—Three hemipterous enemies of cotton in the Belgian Congo, together with their injury, are described and illustrated by colored and other plates, namely, *Lygus vosseleri* Popp., *Empoasca facialis* Jac., and *Helopeltis bergrothi* Reut.

A new pentatomid enemy of rice in Rio Grande do Sul [trans. title], A. DE COSTA LIMA (*Campo [Rio de Janeiro], 6 (1935), No. 10, p. 16, fig. 1*).—Under the name *Ogmocoris reinigeri* n. sp. a description is given of a pentatomid enemy of rice in Porto Alegre.

Distributional and synonymical notes on the beet leafhopper (Eutettix tenellus (Baker)), P. W. OMAN (*Ent. Soc. Wash. Proc., 38 (1936), No. 7, pp. 164, 165*).—Records of the distribution of the beet leafhopper indicate that it not only occurs in most of the western half of the United States but also in western Canada, western Mexico as far south as Guasave, Sinaloa, and in Florida. Specimens collected indicate that it may occur in Jamaica, in Puerto Rico, and also in Palestine in one of its forms.

Studies on the incubation of the chinch bug egg, M. J. JANES and A. HAGER (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 395–402, figs. 3*).—In observations at the Iowa Experiment Station, eggs of the chinch bug hatched in approximately 30 days at 19.5° C., 15 days at 24.5°, 10 days at 29.5°, and 7 days at 34.5°. Temperature seemed not to affect appreciably the percentage of hatch. In each case there was considerable spread in the time of hatching of a given lot of eggs subjected to the same conditions. Relative humidity, although apparently influencing the length of the incubation period in some cases to a slight extent, has its greatest effect on the percentage of hatch. The most favorable relative humidity at the higher temperatures was 80 percent. In one case 98 eggs hatched out of a lot of 100. Chinch bug eggs hatched after submergence in water for considerable periods of time; a number of eggs hatched after 15 days of submergence at 24.5°, but at higher temperatures

the eggs were less resistant to submergence. An increase in the incubation period occurred in fairly direct proportion to the period of submergence. A number of eggs were hatched after being submerged continuously for 23 hr. out of each 24 during the period of incubation.

Studies on temperature and moisture as factors influencing winter mortality in adult chinch bugs, G. C. DECKER and F. ANDRE (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 403–420, figs. 8*).—Chinch bugs collected by the Iowa Experiment Station from different sources varied in their resistance to low temperature exposures. "Bugs secured from the same locality at various times during the winter showed considerable variation in susceptibility to cold. When bugs were exposed for a long period at a constant temperature of −12.2° or −17.7° C., the percentage of mortality increased rapidly for about the first 10 hr. and after that the increase was less rapid. Precooling at sublethal temperatures increased the bugs' resistance to temperatures between −7° and −15°, but the mortality resulting from exposures to lower temperatures was not significantly different from that obtained by instant exposures. When the temperatures were lowered by steps a definite increase in resistance to fairly low temperatures (−7° to −12°) was noted, but this effect was gradually overcome as the exposure was prolonged. Dehydration produced by brief exposures at low relative humidities increased the resistance of the bugs. Chinch bugs which drank water were less resistant to low temperatures than those which did not. At 0° bugs held at high relative humidities lived longer and lost less weight than bugs held at low relative humidities. Chinch bugs submerged in water at 0.0° showed a 60 percent mortality after a 22-day period. Freezing chinch bugs in solid ice proved to be fatal in most instances."

Control measures for mealy bugs on citrus, J. R. WATSON (*Citrus Indus., 17 (1936), No. 7, pp. 15, 18*).—A contribution from the Florida Experiment Station.

Studies on the resistance and immunity of apples to the woolly aphis, Eriosoma lanigerum (Hausm.), M. B. CRANE, R. M. GREENSLADE, A. M. MASSEE, and H. M. TYDEMAN (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 2, pp. 137–163, pls. 4*).—An outline is given of the life cycle of the woolly apple aphid, and the hereditary behavior of the apple with respect to immunity to its attack is described. A description is also given of the entomological technic used in testing for resistance and immunity and of preliminary physiological investigations on the underlying causes. "It is tentatively concluded that the immunity to attack is determined by and dependent upon a certain balance of genetic factors, and that it is governed by a number of genes the action of which is in part complementary and in part cumulative."

Toxicity of selenium-containing plants to aphids, A. M. HURD-KARRER and F. W. POOS (*Science, 84 (1936), No. 2176, p. 252*).—Experiments have shown that the apple grain aphid is sensitive to concentrations of selenium in wheat plants. Aphids placed on 2-month-old plants supplied with concentrations of selenium greater than 3 p. p. m. all died within a few days, while those with lower concentrations lived for as long as a week, although without reproducing actively. Similar results were observed with the common red spider. The plants were stunted by concentrations greater than 3 p. p. m. of selenium. Comparatively few aphids survived on 1-month-old plants grown with but 1 p. p. m. of selenium, although some reproduction did take place. For some reason more of the aphids persisted on rye plants than on wheat, oats, and barley grown in soil treated with sodium selenate at the rate of 10 p. p. m. of selenium, although the number was greatly reduced.

The insect vector for the natural transmission of Eperythrozoon coccoides in mice, C. P. Eliot (*Science, 84 (1936), No. 2183, p. 397*).—The importance of a latent blood infection by *E. coccoides* in white mice used for experimental purposes which (like *Bartonella muris*) is activated by splenectomy is considered. Certain changes in the blood picture and in the size and histology of the spleen for which it is responsible may be sufficiently great at times to be significant in exact studies on the relation of the spleen to disease and resistance.

Transmission experiments with mites and lice have shown the mouse louse *Polyplax serrata* to be the vector. In each of 11 experiments adults and nymphs transmitted *E. coccoides* from the infected to the uninfected host upon which it fed. In 2 other trials in which the adult lice were kept away from the host for several hours, transmission failed to take place. The nymphs from the same host, starved for the same length of time, were capable of transmitting *Eperythrozoon*. These results suggest that the strong digestive fluids of the adult louse destroy the organism, while the less active alimentary juices of the nymph permit longer survival.

Progress of cabbage worm investigations at the Ohio Agricultural Experiment Station, H. L. Gui (*Ohio Veg. Growers Assoc. Proc., 21 (1936), pp. 33–40*).—Further work by the Ohio Experiment Station with the cabbageworm (E. S. R., 73, p. 505), the details of which are here presented, has led to the following recommendations:

"For cabbage a dust consisting of 1 part of paris green, 1 part of hydrated lime, and 11.5 parts of a suitable diluent or a spray consisting of 2 lb. of paris green in 50 gal. of water should be used, but no applications of either material should be made less than 2 weeks before harvest. Any of the dust diluents on the market may be used, although flour has given the best results. Lime or gypsum should not be used in combination with fluorine insecticides.

"A spreader should be used in all sprays. Fish oil, glue, soap, and sulfated alcohol have been used with equal effectiveness. Sprays should be applied under a pressure of at least 200 lb. per square inch. Dust applications are preferred to sprays unless the latter are properly applied. Dust and spray applications should be made at approximately 10-day intervals.

"When it is necessary to apply treatment to cabbage less than 2 weeks before harvest or to cauliflower, broccoli, brussels sprouts, kale, and rape at any time, the use of derris powder is recommended. When used as a dust, derris powder should be diluted to a rotenone content of 0.5 percent, and, when used as a spray, each 50-gal. lot of spray should contain 0.05 lb. of rotenone."

The gipsy moth (Porthetria dispar L.) in the Crimean forests, V. Ю. Parkhomenko (*Neparnii shovkopriad (Porthetria dispar L.) u lisakh Krimu. Kiev: Ukrain. Akad. Nauk, Inst. Zool. ta Biol., 1935, pp. 118, figs. 24; Eng. abs., pp. 115–117*).—The findings of the Crimean forest entomological expeditions of 1932 and 1933, in which the author participated, are reported upon. Data from the literature and the results of the Crimean forest entomological investigations of 1930 and 1931 are included.

"Dynamite" sprays, R. L. Webster (*Better Fruit, 31 (1936), No. [3], pp. 3, 4, fig. 1*).—This is an account of control work with the codling moth, a report of which by Marshall and Groves has been noted (E. S. R., 76, p. 72).

A contribution to the study of Coleophora attacking fruit trees [trans. title], J. Suire (*Ann. École Natl. Agr. Montpellier, n. ser., 24 (1936), No. 2, pp. 137–158, pls. 2*).—This contribution relates particularly to *C. hemerobiella* Scop., its morphology, biology, parasites, and control measures, presented with a list of 31 references to the literature.

The corn earworm.—Third report, L. P. DITMAN and E. N. CORY (*Maryland Sta. Bul. 399 (1936), pp. 77–90, figs. 3*).—In this third report of studies of the corn earworm (E. S. R., 66, p. 55; 70, p. 66), the authors consider the general trend of infestation and report upon varietal resistance, poison bait traps, the response of earworm moths to sugars, moth poisons, and poison traps or feeders, and insecticide tests, the details of the work being presented in tables and graphs. The results led to the recommendation of the following practices and measures that will aid in corn earworm injury:

"Fall plowing causes the destruction of pupal cells, crushes overwintering pupae, exposes pupae to birds and weather. The use of resistant varieties, especially Honey June in Maryland, will cause a reduction of injury. Barium fluosilicate or lead arsenate applied at sufficient intervals to keep the silk covered with poison will reduce injury 60 to 80 percent. It should not be applied to ears with tips exposed. All treated corn should be carefully husked and washed before being eaten. Corn planted early is less injured than corn planted late. Several years' observation indicate a slight depression in infestation on corn maturing around the last week of July and the first week of August; subsequently, earworm rapidly increases in abundance until cold weather."

Report of the tomato fruit worm investigations at Marietta, J. S. HOUSER (*Ohio Veg. Growers Assoc. Proc., 21 (1936), pp. 91–96*).—In reporting upon a continuation of the work of the preceding year by the Ohio Experiment Station with the corn earworm as an enemy of the tomato as noted on page 824, additional information on its biology and a summary of the activities of the year in the Marietta district are presented.

Seventeen different spray and 7 dust formulas were applied and compared with untreated plats. In sprayed plats the best control was obtained by the use of arsenate of lead in which SS-3 (a sulfonated alcohol) was used as a spreader, an average of 96.2 percent of sound fruit having been obtained. In the dusted plats paris green-lime sulfur gave 95.2 percent sound fruit. These results on 5 sprayed and 5 dusted plats are based upon percentages obtained for the harvest of the entire lot of 11 pickings, but the control was largely obtained from the first three applications, July 11, 13, and 15, respectively.

The Noctuidae of Pennsylvania: A manual, H. M. TIETZ (*Pennsylvania Sta. Bul. 335 (1936), pp. 164, figs. 2*).—This contribution deals with moths of the family Noctuidae, which includes cutworms, armyworms, etc., to the number of 570 species and 132 varieties and forms, grouped into 206 genera, that have been taken in Pennsylvania. For every genus there is given the name of the author and a reference to the original description. For each species reference is made to the original description, varieties, synonyms, places where the species has been taken, time of appearance, its life history, if known, and food plants of the larva, if known.

Reference is given in the index to the list numbers of the genera and species of Dyar (E. S. R., 14, p. 783) and of Barnes and McDunnough (E. S. R., 37, p. 563) in their lists of North American Lepidoptera.

A catalog of the Lepidoptera of the Pyrenees [trans. title], J. P. RONDOU (*Ann. Soc. Ent. France, 101 (1932), No. 3, pp. 165–244; 102 (1933), No. 3, pp. 237–316; 103 (1934), No. 3–4, pp. 257–320; 104 (1935), No. 3–4, pp. 189–258*).—A systematically arranged catalog, with the localities of the species, occurrence, and host plant and feeding periods of the larvae if known. The introductory part includes a comparison of the lepidopterous fauna of the Pyrenees with that of the Alps, a six-page bibliography, and a table of the localities cited.

The leaf mines of insects in Spain [trans. title], M. Hering (*Eos [Madrid], 11 (1936), No. 4, pp. 331–384, pl. 1, figs. 15*).—The leaf mines of insects in Spain are described and in some cases illustrated, with the identity of the guests if known. A new genus is erected and new species of miners described.

The vinegar gnats or pomace flies: Their relation to the canning of tomatoes, L. P. Ditman, E. N. Cory, and A. R. Buddington (*Maryland Sta. Bul. 400 (1936), pp. 91–111, figs. 7*).—The results of a study of vinegar gnats during the course of a survey of canning plants and of farms furnishing cannery tomatoes reported upon include the biology of *Drosophila* spp., of which *D. melanogaster* (*ampelophila*) Meig. (officially known as the pomace fly) is the most common, *D. repleta* Woll. sometimes present in great numbers, and *D. buscki* Coq. found to occur at Salisbury, Md.; observations of field infestations, without regard to species, and at canning plants; the reduction of gnat population at canning plants; the quality of raw stock; the effect of buying on grades; methods of culling, washing, and peeling; and observations on compliance with recommendations.

A figure of the suggested set-up for washing and culling tomatoes for canning is included.

Mosquito control engineering, I–VIII (*Engin. News-Rec., 117 (1936), Nos. 4, pp. 118–122, figs. 5; 6, pp. 199–201, figs. 5; 7, pp. 225–228, figs. 4; 8, pp. 266–269, figs. 5; 9, pp. 304–307, figs. 6; 10, pp. 341–343, figs. 4; 11, pp. 372–376, figs. 6; 12, pp. 404–406, fig. 1*).—The first part of this contribution, by L. O. Howard, deals with the growth and importance of antimosquito work (pp. 118–122); part 2, by T. J. Headlee of the New Jersey Experiment Stations, with mosquitoes—species and habits (pp. 199–201); part 3, by R. W. Gies, with control technic and organization (pp. 225–228); part 4, by J. L. Clarke, with inland control methods (pp. 266–269); part 5, by R. J. Van Derwerker, with the salt-marsh problem (pp. 304–307); part 6, by L. L. Williams, Jr., with effective malaria control (pp. 341–343); part 7, by C. M. Adams with ending malaria in New Mexico (pp. 372–374) and W. S. Corkran with mosquito abatement in Delaware (pp. 374–376); and part 8, by J. A. LePrince with malaria and the Mississippi Valley (pp. 404, 405), and by H. F. Gray with California's campaign (pp. 405, 406).

Studies on the fumigation for the eggs of Sturmia sericariae Cornalia, I, II, H. Ito (*Res. Bul. Imp. Tokyo Seric. Col., 1 (1936), No. 1, pp. 1–24; Eng. abs., pp. 8, 24*).—Part 1 (pp. 1–8) reports upon the fumigation of the eggs of *S. sericariae* with various aromatic hydrocarbons, and part 2 (pp. 9–24) on their fumigation with naphthalene and the effects of the fumigated mulberry leaves on the silkworm.

Eggs of this tachinid parasite of the silkworm were killed by naphthalene in 3 hr. and by benzene in 5 hr. without injury to the mulberry leaves, and by both xylene and toluene in 1 hr. and by thymol in 3 hr. with injury to the leaves. The toxicity of the vapor of various aromatic hydrocarbons was found to be related to the quantities of the chemical and the time of exposure.

Economic studies of screw worm flies, Cochliomyia species (Diptera, Calliphorinae), with special reference to the prevention of myiasis of domestic animals, E. W. Laake (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 345–359, pl. 1, figs. 2*).—During the course of a 5-yr. study of the predisposing causes of attack by the screwworm fly on more than 75 ranches in Menard County, Tex., the author found that among sheep and lambs wounds caused by needlegrass (*Aristida*) gave occasion for attack by flies more than any other one cause; among goats and kids the predominating cause was shear cuts; among cattle it was injuries by the horns of other cattle. Calves suffered

most as a result of exposed tissue at birth, and horses and mules from wire cuts. It is pointed out that several of the more common causes of attack are due to ranch practices that can be changed or better timed. Greater care in shearing, dehorning of cattle while they are young, removing and disposing of old barbed wire from dismantled fences instead of leaving it on the ground, and the timing of dehorning, castrating, and branding of animals, and of breeding, so that as little as possible of open sores or wounds will be exposed to flies during the season of their abundance, are particularly stressed.

The percentage of infestation was found to range from 1.38 in 1930 to 4.3 in 1932. The possibility of reducing this infestation by trapping the flies was tried out over an area of approximately 155,000 acres of ranch land in Menard County. The apparent reduction in percentage of infestation, as compared with that on a similar area of about equal size in the same vicinity, was from 2.92 to 1.58 in 1931, from 5.86 to 3.4 in 1932, and from 3.39 to 1.36 in 1933.

Trapping seemed equally effective in years of mild or moderately heavy infestation. The expense as carried out in these tests, however, is too great to justify a recommendation for its general use, but if a more attractive bait for *C. americana* and a cheaper method of operation can be developed, fly trapping may become of distinct practical value.

Seasonal appearance and relative abundance of flies attracted to baited traps, W. G. Bruce and E. F. Knipling (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 361–365, figs. 4*).—The results of systematic fly trapping in the vicinity of Ames, Iowa, are reported on. During the season of 1933 the first flies were taken on March 3, *Phormia regina* having been the first to appear. Other early appearing species were *Calliphora erythrocephala*, the cluster fly, *Scatophaga* spp., *Fannia* spp., and *Cynomyia cadaverina*. The housefly, *Lucilia* spp., *Sarcophaga* spp., the screwworm fly, and other species made their appearance somewhat later. Their comparative seasonal abundance is graphically shown, the housefly, *P. regina*, *Lucilia* spp., the screwworm fly, and *C. cadaverina* having been met with in greatest numbers. A list is given of the flies trapped in 1933 with the dates of their appearance and of flies trapped and their relative abundance in 1933–34.

Notes on the autecology of some fruit-flies.—II, On the mango-fly Chaetodacus ferrugineus var. dorsalis Hendel, K. Koidsumi and K. Shibata (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 7 (1935), No. 4, pp. 370–378*).—This second contribution (E. S. R., 75, p. 816) reports upon *C. ferrugineus dorsalis*.

A revision of the chalcid flies of the genus Perilampus Latreille occurring in America north of Mexico, M. T. Smulyan (*U. S. Natl. Mus. Proc., 83 (1936), No. 2990, pp. 369–412*).—Included in this revision of the chalcid genus *Perilampus* are descriptions of 10 forms new to science. A key to the species of the genus and a known host list are included.

Experimental studies in insect parasitism.—IV, The effect of superparasitism on populations of Trichogramma evanescens, G. Salt (*Jour. Expt. Biol., 13 (1936), No. 3, pp. 363–375, fig. 1*).—In continuation of studies in insect parasitism (E. S. R., 73, p. 517), *T. evanescens* was found able to distinguish healthy from parasitized hosts and when few hosts were available to restrain itself for 8 hr. with a deposition of 5 percent of its available eggs.

A reproduction phenomenon, S. E. Flanders (*Science, 83 (1936), No. 2160, p. 499*).—In this contribution from the California Citrus Experiment Station, further reference (E. S. R., 75, p. 512) is made to the finding that in certain species of parasitic Hymenoptera, particularly of the genus *Coccophagus*, the males develop only as ecto- and/or endo-parasites of larvae of Hymenoptera

within homopterous insects and the females only as endo-parasites of nymphs or adults of such Homoptera (mealybugs or scale insects). "This is a remarkable differentiation in the host relations of the sexes within a species. The production of males in a pure culture of a species having such a habit necessitates the destruction of immature females since they are the only hosts of the male present in the culture. The conditions under which the destruction of the females occurs vary with the species."

"As in other species of Hymenoptera, the male develops from unfertilized eggs deposited by unmated females. These females either deposit their eggs directly on or in the immature hymenopterous host or they deposit them in the fluid media surrounding such hosts. In this fluid media the eggs remain unhatched until the hymenopterous host is in a suitable condition for attack. This peculiar phenomenon is of practical importance in the biological control of insect pests."

Sexual dimorphism of hymenopterous eggs and larvae, S. E. Flanders (*Science, 84 (1936), No. 2169, p. 85*).—Further studies of the biology of *Coccophagus lycimnia*, a parasite of lecaniine scales, are said to have shown that the eggs which develop into males differ in shape from those which develop into females, the differentiation occurring during oviposition. The male egg is sometimes deposited free in the space surrounding the host. This phenomenon is known to occur in another species of *Coccophagus*, and it may also occur in a species of *Tetrastichus* parasitic on the eggs of the eastern tent caterpillar. It was observed by Williams (E. S. R., 36, p. 556) that *Tetrastichus* frequently deposited stalked eggs on the wall of a test tube. In the first and second larval instars many species of *Coccophagus* and related genera exhibit striking sexually dimorphic characters.

The citrus red mite (spider) problem in southern California, A. M. Boyce (*Calif. Citrogr., 21 (1936), No. 11, pp. 418, 438, 439, 440, 441, fig. 1*).—This is a discussion of the citrus red mite problem from the California Citrus Experiment Station. An earlier account has been noted (E. S. R., 75, p. 234).

Ixodes ricinus in relation to its physical environment, II–IV, J. MacLeod (*Parasitology, 27 (1935), Nos. 1, pp. 123–144, figs. 8; 4, pp. 489–500, figs. 2; 28 (1936), No. 3, pp. 295–319, figs. 5*).—Part 2 of this contribution (E. S. R., 71, p. 821) deals with the factors governing survival and activity of the castor-bean tick, and part 3 with climate and reproduction; part 4 consists of an analysis of the ecological complexes controlling distribution and activities.

The author is led to conclude that "the biotic factors in the environment of the tick *I. ricinus* exercise little effect on the geographical or local distribution of the species or on its seasonal prevalence. The local distribution is determined by edaphic factors, a wet, mossy, or peat soil and a dense mat of old vegetation or a rank growth being necessary for survival of the tick. In Britain, the critical season for survival is summer, during which the moisture factor in the microclimate acts in a limiting capacity."

ANIMAL PRODUCTION

[Livestock investigations in California] (*California Sta. [Bien.] Rpt. 1935–1936, pp. 54–56, 57, 58, 109–117*).—Among research activities for which results were reported are the deficiencies of barley for swine feeding; the carotene and vitamin A requirements of cattle, sheep, and swine; the effect of calcium and phosphorus deficiencies in various types of animals; the effect on ruminants of rations devoid of roughages; the evaluation of numerous byproduct feeds; cattle, horse, pig, and sheep breeding problems; and sheep and lamb feeding.

The poultry studies reported deal with selection for production, inbreeding turkeys, the requirements of chicks for two new fat-soluble vitamins, the rela-

tion of certain vitamins to dermatitis in chicks and turkeys, the protein requirements of chicks and turkeys, the effect of cold storage and high temperature on eggs, the cause of "pink white" and "olive yolk" deterioration in eggs, and factors affecting the candling of eggs.

[Investigations with livestock in Hawaii] (*Hawaii Sta. Rpt. 1936, pp. 70–79, fig. 1*).—Trials with beef cattle have yielded results on the relative value of pigeonpeas and improved pastures for fattening steers when used as the only feed and when supplemented with molasses and protein concentrates, and the value of a concentrate mixture containing pineapple bran, cane molasses, cane bagasse, and soybean oil meal for fattening steers, both by L. A. Henke; and the digestibility of Napier grass, by S. H. Work.

From swine tests information was obtained on the comparative value of a pineapple bran-molasses ration v. a barley-molasses ration for fattening pigs, and the value of local fish meal as a protein supplement for swine, both by Henke and G. W. H. Goo; and the use of garbage in the fattening ration, by Henke.

Poultry tests produced results on the use of batteries for laying and breeding hens, the value of freshly cut alfalfa v. alfalfa leaf and blossom meal, the effect of variations in relative humidity on hatchability, the value of artificial illumination for the laying flock, and a comparison of colony houses and battery brooders for growing chicks, all by C. M. Bice; and the use of molasses in the ration, and cross-breeding for meat and egg production, both by Bice and B. A. Tower.

[Investigations with livestock by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 81, 84–87, 131–133, 135*).—Tests with sheep have yielded information on rations and feeding methods for fattening lambs, and long v. chopped alfalfa hay for pregnant ewes, both by F. B. Morrison and J. P. Willman; the relation of feeding and management to the cause of the "stiff lamb" disease, by Willman, Morrison, and P. Olafson; the nutritive value of proteins in important feeds and typical mixed rations as determined by metabolism experiments with lambs, by Morrison, J. I. Miller, and L. A. Maynard; and temporary pasture crops for lambs, by Willman.

Other livestock experiments reported include a comparison of protein supplements and also the effect of certain vitamin supplements for growing and fattening swine, by Morrison, Willman, and H. M. Briggs; vitamin supplements for brood sows, by Willman; live weight gains per acre on beef cattle as obtained from improved pasture, by R. B. Hinman; the cause of varying colors in beef, by Hinman and C. M. McCay; cod-liver oil and muscle dystrophy in calves, by G. Davis and Maynard; and protein requirements of the work horse, and minerals for growing colts, both by M. W. Harper and R. M. Watt.

Poultry studies yielded results on the vitamin G requirements of poultry, by L. C. Norris; the relative vitamin G content of feeding stuffs used in poultry rations, by H. S. Wilgus, Jr., Norris, and G. F. Heuser; the nutritive properties of ground soybeans and of corn gluten meal, by Norris and Heuser; the protein requirements of laying hens, and the nutritive requirements of turkeys, both by Heuser; the cause and prevention of perosis in chicks and pheasants, by Wilgus and Norris; a genetic study of interior egg quality, by G. O. Hall; and the effect of temperature, relative humidity, and mechanical jarring on egg quality after short storage periods, by Hall and A. Van Wagenen.

[Livestock investigations in West Virginia] (*West Virginia Sta. Bul. 278 (1936), pp. 6, 7, 8–10, fig. 1*).—Brief reports are presented on the relative merits of first-cross and second-cross lambs by Corriedale rams, the effect on the size and quality of the carcass of creep-feeding grain to calves on pasture dur-

ing suckling as compared to no grain during suckling and finishing in dry lot on grain and alfalfa, the effect of grass on the color of beef, and corn silage studies. From poultry studies data are reported on the effect of age on egg production and egg weight and the interrelations between age of maturity, rate of production, and longevity; methods of feeding grain to pullets; the effect of high protein mash for laying hens; and the influence of diet on the incidence of perosis in chicks.

Relation of the carotene content of certain feed materials to their vitamin A potency, G. S. Fraps, R. Treichler, and A. R. Kemmerer (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 9, pp. 713–716*).—The Texas Experiment Station has compared the carotene content and vitamin A activity (as measured by a modified Sherman-Munsell method of bio-assay) in 15 samples of feed, including 7 of alfalfa meal, 5 of peanut hay, 2 of yellow corn, and 1 of Johnson grass hay. The alfalfa samples ranged from 7.3 to 63.5 μg of carotene per gram and the peanut hay samples from 5.6 to 26.5 μg of carotene per gram of sample. The yellow corn samples contained 1.7 and 2.6 μg and the Johnson grass hay 9.3 μg of carotene per gram of sample. The average vitamin A potency per microgram of carotene was 1.4, 1.3, 1.2, and 1.1 Sherman-Munsell units in alfalfa products, peanut hay, yellow corn, and Johnson grass hay, respectively. In all cases a factor of 1.2 is used to convert Sherman-Munsell units to international units of vitamin A. One μg of carotene in the international standard and 1 μg of purified carotene dissolved in oil had a value of 1.4 Sherman-Munsell units, which is practically the same as for 1 μg of carotene in the alfalfa or peanut hay.

The effect of storage upon the vitamin A content of alfalfa hay, M. C. Smith (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 9, pp. 681–684*).—In a study at the Arizona Experiment Station the effect of storage of baled alfalfa hay upon its vitamin A content has been determined by bio-assay. Leaves of the baled hay stored from August to November in a hay barn contained 50 percent less vitamin A than the freshly baled alfalfa. No further destruction of vitamin A occurred during subsequent storage through November, December, and January. With rising temperatures in the spring the destruction of vitamin A was again stimulated, so that after 12 months' storage the alfalfa contained only 25 percent as much vitamin A as was found in the fresh sample.

Comparative tests on the nutritive value of a red clover-grass mixture harvested at different stages of growth [trans. title], W. Kirsch and H. Jantzon (*Biedermanns Zentbl., Abt. B, Tierernähr., 8* (*1936*), *No. 4, pp. 354–372, fig. 1; Eng. abs., p. 372*).—The nutritive value of a clover-grass mixture cut at different stages of maturity has been determined on the fresh green material, silage (ensiled with 1 percent of sugar), and cured hay.

The results indicate a decrease in crude protein and an increase in crude fiber and also a decrease in the digestibility of the nutrients as the plants approached maturity. This decline in digestible nutrients was gradual in the green material and silage but showed a pronounced drop between the first and second cuttings for the hay. In comparison with the freshly cut material there appeared to be a loss of about one-third of the protein and one-half of the starch value in drying, whereas losses in the silage were slight. In digestion trials with wethers the digestibility as determined directly when these products were fed alone or indirectly when they were fed as a supplement to a basal ration were in close agreement.

Silage production, E. S. Hopkins and P. O. Ripley (*Canada Dept. Agr. Pub. 525* (*1936*), *pp. 79, figs. 24*).—This publication presents a popular discussion of the silage production problem, with special emphasis on the methods of growing and ensiling those crops most suitable for silage.

Blackstrap molasses as a livestock feed, M. G. Snell, C. W. Upp, and R. H. Lush (*Louisiana Sta. Circ. 19 (1937), pp. 4*).—The suitability of molasses as a feed for mules, beef cattle, hogs, dairy cattle, and poultry is discussed, and recommendations regarding proper amounts to feed and ways of feeding are offered.

Inspection of commercial feedstuffs, P. H. Smith (*Massachusetts Sta. Control Ser. Bul. 85 (1936), pp. 64*).—This report presents the official chemical analyses of 1,801 samples of commercial feeding stuffs collected during the year ended September 1, 1936. In addition the physical and chemical analyses of 55 samples of oats, and the calcium and phosphorus content of a number of chick starting and growing rations are shown (E. S. R., 74, p. 378).

Commercial feeding stuffs from September 1, 1935, to August 31, 1936, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 532 (1936), pp. 194*).—This is the usual report (E. S. R., 74, p. 830) of the results of chemical analyses and microscopic examination of 3,471 samples of feeding stuffs. The results of bio-assay of 14 vitamin D carriers are also presented.

Feeding cottonseed products to beef cattle, compiled by C. F. Clark (*Mississippi Sta. Bul. 317 (1936), pp. 88*).—This bulletin is an extensive compilation of experimental data from many sources relating to the feeding of cottonseed products to beef cattle. The material is grouped in 5 sections dealing with cottonseed meal as a concentrate, cottonseed cake as a concentrate, whole cottonseed as a feed, cottonseed hulls as a roughage, and other studies with cottonseed products as a feed for beef cattle.

Fattening beef calves for market, G. A. Branaman (*Michigan Sta. Spec. Bul. 280 (1936), pp. 48, figs. 11*).—This bulletin presents the results of four series of feeding experiments with fattening beef calves. The first series compared limited grain feeding v. full grain feeding. The second determined the value of linseed meal as a supplement to a ration of shelled corn, corn silage, and alfalfa hay. The third compared shelled corn and ground barley, each separately and in combination with linseed meal, and oats plus linseed meal as supplements to corn silage and alfalfa hay, and the fourth series tested the suitability of various rations and planes of nutrition for the production of long yearling fat cattle.

It is concluded that (1) beef calves may be finished into satisfactory yearlings with considerably less than a full feed of grain when corn silage and alfalfa hay are fed, (2) it is desirable to add a high protein supplement like linseed meal to a fattening ration of corn or barley with silage and alfalfa hay, (3) high grade ground barley and No. 2 shelled corn are of similar value in the fattening ration, but heavy weight ground oats are 11 percent less valuable than the shelled corn, (4) a plane of nutrition sufficiently high to produce gains of over 1 lb. per head per day is more profitable than when calves are so fed as to gain less than 1 lb. per day, (5) higher selling price or wider margin is necessary with increased finish after a long feeding period because of the higher feed requirements for such gains, and (6) cattle that would grade good to choice in June may generally be expected to sell higher in August or September if continued on feed.

Studies on reproduction in cattle, I, II, J. Anderson (*Empire Jour. Expt. Agr., 4 (1936), Nos. 14, pp. 186–195, figs. 3; 15, pp. 197–207, figs. 2*).—Two papers from the Experimental Station, Naivasha, Kenya, are presented.

I. *The periodicity and duration of oestrus.*—The mean duration of the oestrous cycle in cattle was observed to be 20.1 days, with a range from 17.9 to 24.2 days. The mean duration of oestrum was found to be 1 hr. 20 min. The duration of oestrum had no apparent relationship to the preceding or subsequent dioestrous cycle or interoestrous periods.

II. The influence of environmental factors on reproduction.—In considering the possible influence of climatic and nutritional factors on the periodicity and duration of oestrum in cattle, there is evidence of a possible correlation with amount of sunshine, but no indication of correlation with rainfall or temperature. Feed supply as furnished by pastures under changing seasonal conditions is also unrelated to the frequency or duration of oestrum.

Soybeans and soybean oilmeal for pigs, W. L. Robison (*Amer. Soybean Assoc. [Proc.], 15 (1935), pp. 27–29*).—This article presents a résumé of a number of swine feeding tests at the Ohio Experiment Station in which various amounts of soybeans and different process soybean oil meals have been included in the ration of growing and fattening pigs. The results with raw soybeans indicate that (1) they are worth more for pigs on pasture than for those in dry lot, (2) they have a higher value for shotes than for younger pigs, and (3) not more than 8 to 10 percent of soybeans in the ration can be fed for any prolonged period without danger of a high percentage of soft carcasses.

The trials with different lots of soybean oil meal gave highly variable results. It appears that such factors as the temperature reached in the manufacture of the meal and the moisture content of the beans or meal when the heat is applied influence the quality of the meal for pigs. In trials with a nutlike expeller type soybean oil meal, this product was found to have a feeding value approaching that of 60-percent protein tankage. Such soybean oil meal has a considerably greater value than raw soybeans for pigs.

Investigations on the nitrogen excretion in the urine as influenced by the consumption and elimination of water by work horses in a resting state within the limits of minimum protein requirements [trans. title], H. Nitsche (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 3, pp. 243–260; Eng. abs., pp. 259, 260*).—The average water consumption of Shire horses at rest ranged from 20 to 30 kg daily, the amount varying with individuals, the quantity of dry feed consumed, and climatic conditions. The proportion of dry feed to water varied from 1:3.3 to 1:4.2. The total urine excretion was exceedingly small, averaging from 3 to 5 kg daily, or only from 10 to 15 percent of the water intake. In summer the urine excretion was more variable, ranging from 2.8 to 18 kg per day. The nitrogen concentration in the urine also showed a marked variation, ranging from 0.2 to 1.4 percent. On this basis the amount of total nitrogen eliminated in the urine from day to day was quite constant, totaling from 40 to 50 g for a horse at rest and receiving an above-maintenance ration.

Thermal effect on the rate and duration of the embryonic heart beat of Gallus domesticus, A. L. Romanoff and M. Sochen (*Anat. Rec., 65 (1936), No. 1, pp. 59–68, figs. 3*).—The [New York] Cornell Experiment Station has studied the effect of varying the environmental temperature above or below 37.5° C. on the rate and duration of the heartbeat of chick embryos at various stages of development. It is shown that at normal temperature (37.5°) the pulse rate increased rapidly from the second to the eighth day of embryonic development and then remained almost constant during the remainder of the incubation period. Either gradual or abrupt exposure to extreme temperatures (high or low) resulted in linear changes in the rate of heartbeat. Eventually breaks occurred in the primary linear trend, followed by secondary linear changes. The sensitivity of the contractive impulses of the heart to temperature change decreased with advance in age of the embryo. In all cases of exposure to extreme temperature, except in the abrupt exposure to high temperature, there was a general increase in the duration of the heartbeat with advancing development of the embryo.

Ether soluble lipoid phosphorus lecithin and cephalin distribution in the development of the chick, O. E. Kugler (*Amer. Jour. Physiol., 115 (1936), No.*

2, *pp. 287–291, figs. 2*).—Based on the determination of the total ether-soluble extract, ether-soluble lipoid phosphorus, lecithin, and cephalin in the yolk and in the embryo and membranes, exclusive of yolk sac, at regular intervals throughout incubation, it is evident that the phospholipid metabolism in the developing chick embryo reaches its highest stage between the fifteenth and seventeenth days of incubation. The lipoid phosphorus per 100 g of embryo (dry weight) shows a rise to the ninth day, followed by a drop to the end of the incubation period. Lecithin and cephalin parallel each other, maintaining a ratio of about 3:1 in both yolk and embryo fractions throughout incubation, and show the same fluctuation trends as does ether-soluble lipoid phosphorus.

A new nutritional disease of the chick embryo, T. C. Byerly, H. W. Titus, N. R. Ellis, and W. Landauer (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1542–1546, fig. 1*).—This report from the U. S. D. A. Beltsville Research Center and the [Connecticut] Storrs Experiment Station describes a disease which has been frequently encountered during recent years in the chick embryo. It is characterized by a shortness of the bones, the anteroposterior axis of the skull and the tarsometatarsi being most strikingly affected. Such abnormal embryos usually died during the third week of incubation, although they occasionally hatched and the few that have been raised lost all abnormal appearance in the course of 10 weeks.

It has been demonstrated that this disease is of nutritional origin, and that it is prevented by supplying a factor or factors in the ration of the parent stock by additions of wheat germ, liver, or whey. Permitting the birds access to direct sunlight and green range increased the activity, amount, or utilization of the factor or factors.

Micromelia of chicken embryos and newly hatched chicks caused by a nutritional deficiency, W. Landauer (*Anat. Rec., 64 (1936), No. 2, pp. 267–276, figs. 5*).—Continuing the investigation reported above, this phase deals with the morphological and histological features of the affected chicks. The principal seat of disturbance is in the calcification and formation of periosteal bone, with only slight abnormalities observed in the growing cartilage. Characteristic symptoms of the abnormality are the replacement of the periosteal bone by unorganized detritus, a relative scarcity of osteoblasts, restriction of calcification to the periphery of the bones, low and irregular cartilage columns, and small cartilage cells. The long bones of the wings and legs are shortened to about the same extent, and the greater the degree of shortening the more abnormal is their histological structure. The ribs are similarly affected, although to a less extreme degree, but the bones of the skull appear normal. Apparently this is the first reported instance of a prenatal nutritional deficiency which results in a disproportionate stunting of the extremities

The multiple nature of the third factor of the vitamin B complex, S. Lepkovsky, T. H. Jukes, and M. E. Krause (*Jour. Biol. Chem., 115 (1936), No. 2, pp. 557–566, figs. 4*).—This contribution from the California Experiment Station presents definite evidence that the "third factor" of the vitamin B complex necessary to supply the requirements of the rat (E. S. R., 75, p. 282) consists of two components. Details of the procedure for their separation are described. The first component prevented or cured acute dermatitis in rats but had no effect on chick dermatitis. The second component, previously described as the filtrate factor (E. S. R., 76, p. 81), prevented or cured chick dermatitis but when fed in the absence of the first component aggravated the rat dermatitis. Both components are required by the rat for normal growth, and symptoms of the deficiency of the second factor are described.

Pellagra-like syndrome in chicks, S. Ansbacher, G. C. Supplee, and R. C. Bender (*Jour. Nutr., 11 (1936), No. 6, pp. 529–536, fig. 1*).—In a series of experi-

ments employing Ration 240–H of Kline et al. (E. S. R., 69, p. 844), it is demonstrated that the use of either heat-treated commercial casein or unheated vitamin-free casein in the ration resulted in the occurrence of a pellagra-like syndrome in a high percentage of chicks. The heated commercial products sustained more rapid growth.

Supplementing the rations with a milk vitamin concentrate treated with fuller's earth to remove lactoflavine prevented the syndrome on the heated casein diet, but was less effective on the vitamin-free casein diet. Concentrates prepared from milk and retaining the lactoflavine or from rice polish entirely prevented the development of this syndrome in each instance. Supplements of crystalline vitamin B_1 and lactoflavine were ineffective in this connection. Apparently the factor or factors preventing this syndrome may be at least partially adsorbed on fuller's earth and are present to some extent in heated commercial casein. In opposition to the findings of Lepkovsky et al. above, the authors conclude that the factor or group of factors which prevents and cures the dermatitis in rats is identical with that which prevents the pellagra-like syndrome in chicks.

In vitro studies on lactic acid metabolism in tissues from polyneuritic chicks, W. C. Sherman and C. A. Elvehjem (*Biochem. Jour., 30 (1936), No. 5, pp. 785–793*).—In this study at the Wisconsin Experiment Station samples of fresh minced brain, heart, and kidney tissue from both normal and polyneuritic chicks were used for in vitro studies on the rate of lactic acid oxidation. Measures included rate of oxygen uptake, rate of lactic acid removal, and estimation of methylene blue reduction time.

No significant differences were noted in the reaction of brain tissues from the two lots, but in avitaminous heart tissue a decreased oxygen uptake and a slower rate of lactic acid removal was observed. The rate af lactate oxidation in avitaminous brain was unaffected by the addition of vitamin B_1, but a similar addition caused an increase in the rate of oxidation in avitaminous heart. Additions of pyruvic acid inhibited the rate of lactic acid dehydrogenaton to a greater extent in the avitaminous heart and kidney than in normal tissue. It is suggested that the action of vitamin B_1 in lactate metabolism is not primarily concerned with the dehydrogenation of the lactic acid but affects it indirectly by participation in some closely associated reaction.

In vitro action of crystalline vitamin B_1 on pyruvic acid metabolism in tissues from polyneuritic chicks, W. C. Sherman and C. A. Elvehjem (*Amer. Jour. Physiol., 117 (1936), No. 1, pp. 142–150*).—In further studies the oxygen uptake of fresh minced brain and kidney tissue from both normal and polyneuritic chicks in pyruvate substrate has been determined. The respiration of the avitaminous brain and kidney tissue in this substrate was inhibited, particularly in the case of the latter. The addition of small quantities of vitamin B_1 to the pyruvate substrate increased the oxygen uptake nearly to the level of that of normal tissue. This reaction was accompanied by an increased removal of the pyruvate, although not to a normal level, suggesting that the effects observed in this trial may be secondary to the participation of the vitamin in some other reaction closely associated with pyruvate oxidation.

A study of anaerobic glycolysis in tissues from polyneuritic chicks: The negative action of vitamin B_1, W. C. Sherman and C. A. Elvehjem (*Amer. Jour. Physiol., 117 (1936), No. 1, pp. 151–154*).—In further studies on the carbohydrate metabolism of polyneuritic chicks it is shown that fresh samples of brain, heart, kidney, liver, and skeletal muscle in vitro readily form lactic acid from glucose or glycogen under anaerobic conditions. There was no significant accumulation of pyruvic acid under these conditions. The

addition of vitamin B_1 had no effect on the rate of anaerobic glycolysis, indicating that this vitamin has no function in anaerobic carbohydrate metabolism and its action is limited to the oxidative metabolism of these carbohydrate intermediates.

The effect of polyneuritis in chicks upon the vivo rate of removal of pyruvate injected intravenously, W. C. SHERMAN and C. A. ELVEHJEM (*Jour. Nutr., 12 (1936), No. 3, pp. 321–328, fig. 1*).—In this phase of the study sodium pyruvate was injected intravenously into normal and polyneuritic chicks. Blood analyses indicated a very rapid removal of the pyruvate from the blood of the normal chick, while a much slower rate of removal was noted in the polyneuritic lot. These results confirm the view that in polyneuritis there is a failure in the tissue metabolism of pyruvic acid.

The use of wax in the plucking of poultry, N. H. GRACE (*Ottawa: Natl. Res. Council and Dominion Dept. Agr., 1935, pp. 19, pl. 1, figs. 16*).—This publication gives a detailed description of the various operations involved in the wax plucking of poultry. The methods have proven practical for use on the farm and in the small plant.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and dairy products in California] (*California Sta. [Bien.] Rpt. 1935–36, pp. 56, 117–121*).—Significant findings are described on high milk and fat production; factors involved in the development of oxidized flavor in milk; the elimination of feed flavors from milk; the improvement of quality of butter, cultured buttermilk, and ice cream; and improved methods of testing dairy products as to adequate pasteurization and detection of gelatin.

[Dairy cattle investigations in Hawaii], L. A. HENKE and G. W. H. GOO (*Hawaii Sta. Rpt. 1936, pp. 68–70*).—The results of feeding tests are briefly noted in determining the feeding value of various concentrate mixtures containing such local feeding stuffs as pineapple bran, molasses, and cane bagasse; the use of molasses in improving roughage consumption; and the comparative value of green Sudan grass v. green Napier grass.

[Investigations with dairy cattle and dairy products by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 80, 81, 82, 83, 94–96, 97–99*).—Dairy cattle studies gave results on the influence of quality and quantity of protein in the concentrate ration on the production of dairy cows fed hay and corn silage, by G. W. Salisbury, F. B. Morrison, E. S. Savage, E. S. Harrison, and S. H. Work; raising dairy calves on calf pellets and calf starters, by Savage, P. E. Newman, and Harrison; the influence of coconut oil meal and palm-kernel oil meal on the percentage of fat in cow's milk, by Savage, Harrison, L. A. Maynard, and Work; and bull indexes, by Savage and C. F. Crowe.

From investigations with dairy products results are reported on the specific heat of fat globules in milk, by P. F. Sharp and A. H. Rishoi; the relation of ascorbic acid to the development of oxidized flavor in milk, by Sharp, E. S. Guthrie, and G. M. Trout; the quantitative determination of lactic acid in butter, by H. C. Troy and Sharp; a vacuum method of cooling milk and cream, by Guthrie; proteolytic bacteria in milk, by C. N. Stark, H. J. Brueckner, and P. Stark; varieties of *Streptococcus lactis*, by J. M. Sherman and E. S. Yawger, Jr.; and nonpathogenic hemolytic streptococci, by Sherman, P. Stark, and C. F. Niven, Jr.

[Experiments with dairy cattle and dairy products in West Virginia] (*West Virginia Sta. Bul. 278 (1936), pp. 13–16*).—Dairy cattle studies have yielded information on simplified rations for dairy cows, the phosphorus require-

ments of heifers during gestation and lactation, the cost of raising dairy calves, and the comparative value of Sudan grass v. sweetclover for pasture.

From dairy products studies results are reported on the cause and prevention of oxidized flavor in milk and the cause of bitter flavor in sour cream.

Feeding dairy cows, R. H. LUSH and E. W. NEASHAM (*Louisiana Sta. Circ. 18 (1937), pp. 43, figs. 5*).—This is primarily a revision of Louisiana Station Circular 1 (E. S. R., 63, p. 567), with supplementary data.

An experiment in chopping alfalfa hay at the time of storage, T. E. WOODWARD and J. B. SHEPHERD (*Jour. Dairy Sci., 19 (1936), No. 11, pp. 697–706, figs. 2*).—The U. S. D. A. Bureau of Dairy Industry has made a comparative study of finely chopped (¼ in.), coarsely chopped (¾ in.), and long alfalfa hays. These hays contained from 25 to 27 percent moisture when stored.

Approximately three times as much finely chopped and twice as much coarsely chopped hay could be put in a given space as hay in the long form. The finely chopped hay heated much more and the coarsely chopped hay somewhat more than the long hay. The chopped hays lost all trace of green color during storage, the fine hay ranging from black to brown and the coarse hay being light brown, whereas a considerable percentage of original green color was retained in the long hays. Carotene loss was extensive in all lots, but somewhat greater in the chopped hays. The loss of dry matter during storage, while moderate in all cases, was highest (6.5 percent) in the finely chopped lot. The black chopped hay was the least palatable of the various lots, while the long hay proved somewhat more efficient than the chopped hays in tests with milking cows.

Silage crops for dairy cattle, W. B. NEVENS (*Illinois Sta. Circ. 463 (1936), pp. 16, fig. 1*).—This circular briefly discusses the advantages of silage as a feed for dairy cattle and the adaptability of corn and certain other crops for ensiling. Practical suggestions are offered on the proper stage of maturity for harvesting, methods of putting crops into the silo, the prevention of spoilage, estimating the money value of silage, and measuring the capacities of silos.

The influence of grass silage prepared with and without mineral acid on the acid base equilibrium, health, and production of dairy cows [trans. title], E. BROUWER and N. D. DIJKSTRA (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 4, pp. 340–353, figs. 2; Eng. abs., p. 353*).—Two groups of 12 milking cows each were fed ordinary grass silage and mineral acid grass silage, respectively. The ordinary silage was of low quality, while the acid silage was well preserved. Digestion trials showed little difference in the digestibility of the fat, nitrogen-free extract, and fiber of the two lots, but the digestibility of the protein in the ordinary silage was considerably lower than in the acid silage. Feeding the acid silage (pH 3.7 to 4) without supplementary bases resulted in lowering the pH of the urine to about 5.5 and a marked increase in urinary ammonia accompanied by a sharp reduction in the carbonic acid of the blood. This condition was readily corrected by adding either chalk or soda to the ration. Feeding acid silage caused a decrease in live weight of the animals and was reflected in the quality of the product by poor creaming quality and an increase in rennet coagulability. For the short duration of this experiment the level of milk production and the fat and total solids content of the milk was unaffected by the abnormal acid base equilibrium resulting from feeding acid silage.

Soybeans and soybean products for dairy cows, J. W. WILBUR and J. H. HILTON (*Amer. Soybean Assoc. [Proc.], 15 (1935), pp. 24, 25*).—This article presents a résumé of a number of trials conducted at the Indiana Experiment

Station. Data are presented on the comparative values of soybean oil meal and linseed meal in a dairy ration, the influence of soybeans on the fat content of milk, and the effect of time of harvest on the feeding value of soybean hay.

Dried blood as a source of protein for dairy cows, J. G. Archibald (*Massachusetts Sta. Bul. 334 (1936), pp. 7*).—In a further study to determine the value of slaughterhouse byproducts as a source of protein for milking cows (E. S. R., 74, p. 386), two groups of 11 cows each were fed by the double reversal method over four 40-day periods. Approximately equal amounts of digestible protein were supplied in each ration, 10 percent cottonseed meal and 10 percent soybean meal in the control ration being replaced by 10 percent dried blood and 10 percent cornstarch in the test mixture. No difficulty was experienced in getting the cows to eat the dried blood ration. There was no significant difference between the rations with reference to general appearance of the cows, milk production, composition, flavor, or curd tension of the milk. A slightly significant difference in live weight gains in favor of the control ration was noted. It is concluded that dried blood may be considered a satisfactory substitute for a mixture of cottonseed meal and soybean meal.

The metabolism of galactose.—II, The synthesis of lactose by slices of active mammary gland in vitro, G. A. Grant (*Biochem. Jour., 29 (1935), No. 8, pp. 1905–1909*).—In experiments at the Lister Institute, London, slices of freshly desiccated mammary gland of freely lactating guinea pigs were immersed in physiological salt solutions containing different hexoses. It is shown that glucose is readily converted into lactose, while there was but little evidence of synthesis from either fructose, mannose, or galactose. It seems likely that any of these forms must be converted into glucose before they can serve as substrates for the synthesis of lactose. A slight synthesis of organic phosphates obtained in one instance from added glucose and phosphate is noted.

Mineral metabolism in the calf and the addition of inorganic minerals to the calf's diet, E. J. Sheehy and B. J. Senior (*[Irish Free State] Dept. Agr. Jour., 34 (1936), No. 1, pp. 1–32, figs. 5*).—A series of feeding trials and balance experiments conducted at University College dealing with the mineral metabolism of calves weaned from milk at 7 weeks of age and reared on a dry concentrate and hay diet is reported. A deficiency of sodium chloride in the ration was reflected in unthrifty condition, harsh coat, and low retention of both calcium and phosphorus. Supplements are deemed particularly necessary when low quality roughage is supplied. Calcium deficiency which frequently resulted from feeding poor quality hay or very low hay consumption decreased the appetites, retarded shedding of old hair, and resulted in a low retention of both calcium and phosphorus. Supplying inorganic calcium sufficient to raise the calcium-phosphorus ratio above unity corrected the calcium deficiency and also increased phosphorus retention. No evidence of phosphorus deficiency occurred when a large part of the ration consisted of cereals and byproducts. The addition of supplemental iron or iodine failed to improve the ration. The addition of cod-liver oil to a diet including poor quality hay increased the digestibility of the entire ration and improved the retention of both calcium and phosphorus. However, no beneficial effects were noted from adding cod-liver oil to a ration containing good quality roughage.

Milk and milk products, C. H. Eckles, W. B. Combs, and H. Macy (*New York and London: McGraw-Hill Book Co., 1936, 2. ed., pp. XIII+386, figs. 92*).—The second edition of this text (E. S. R., 62, p. 463) retains the same arrangement of chapters as the original edition, but has been revised to include certain changes and developments in the dairy industry and advances in the knowledge of fundamental facts concerning milk and its products.

The influence of the physical state of the fat on the calculation of solids from the specific gravity of milk, P. F. SHARP and R. G. HART (*Jour. Dairy Sci., 19 (1936), No. 11, pp. 683–695, fig. 1*).—This report from the [New York] Cornell Experiment Station, in considering certain variables which are responsible for lack of agreement and reproducibility of results in calculating the total solids of milk from the butterfat content and the specific gravity, has shown that the specific gravity at 15° C. is markedly influenced by the temperature to which the milk has been previously subjected. This condition is due to a lag in the change of the physical state of the fat in the globules as the temperature is adjusted to this point. This effect becomes more pronounced as the fat content of the milk increases. The authors propose that the specific gravity determination on milk be made at 30° after previously warming the milk to 45° for ½ min., under which condition the fat will be in a liquid state. By following this procedure the equation

$$\text{Total solids}=1.2537\ \text{fat}+0.2680\frac{\text{lactometer}}{\text{sp. gr. of milk}}$$

has been found to give close agreement between calculated and actual total solids content (as determined by drying) in a comparison of 421 samples representing a wide range of conditions regarding source of milk, season, and breed.

To what extent do tests from composite samples and fresh samples of milk agree? D. MEADE and J. N. LECKIE (*Milk Plant Mo., 25 (1936), No. 8, pp. 28–30*).—In a study at the Maryland Experiment Station the test of regular 10-day composite samples was compared with the test on fresh milk samples taken on 3 days of each month. The trial included the milk from nine farms and extended over a 6-mo. period. The periodic fresh samples averaged 0.09 percent higher than the average of the composite samples, 60 percent of the composite samples testing lower than the fresh samples, 12 percent the same, and 27 percent higher. There was an average maximum range of 1.01 percent butterfat in the fresh samples over the entire period, as compared with an 0.84 percent range in the composites.

Why do fat tests vary? A perpetual query, J. C. MARQUARDT and H. L. DURHAM (*Farm Res. [New York State Sta.], 3 (1937), No. 2, p. 8*).—With further reference to this subject (E. S. R., 76, p. 237), this article presents data indicating that the methods of sampling at the milk plant may produce slight variations. In a comparison of three methods 31.5 percent of the samples gave exact checks by the three methods, 80 percent checked within 0.1 percent, and 95 percent within 0.2 percent, indicating the small significance of the variations in tests due to commonly used sampling methods.

Effect of sunlight on some milk and cream products, F. J. DOAN and C. H. MYERS (*Milk Dealer, 26 (1936), No. 1, pp. 76, 78, 80, 82, 84–87, figs. 2*).—In a study at the Pennsylvania Experiment Station, it is shown that exposure of certain milk and milk products to sunlight ordinarily results in the development of off-flavors designated either as burnt or tallowy. These two appear to be distinct flavor changes, the former predominating in low fat products, the latter in high fat products. Paraffined paper milk bottles as used in this study offered considerably more protection to skim milk, whole milk, and buttermilk against the development of burnt flavor than was afforded by clear glass bottles. However, paper bottles were no protection to whole milk or cream against tallowy flavors caused by sunlight. Blue- and green-colored paper bottles or blue and green Cellophane wrappers on paper bottles retarded the development of both burnt and tallowy flavors. Off-flavors were detected first

in the milk in glass containers, but the intensity of tallowy flavor in milk and cream was greater in the paper bottle.

Off-flavored milk: A problem of animal nutrition, J. A. Anderson (*Milk Dealer, 26 (1936), No. 1, pp. 60, 62, 64, 66*).—Results are presented which indicate that the common occurrence of rancid and oxidized flavors in milk is fundamentally a matter of feeding. Such off-flavors were much more prevalent in milk from a herd receiving a ration of corn silage, field-cured alfalfa hay, and grain than when machine-dried alfalfa hay or fresh carrots was added to the ration. The addition of massive doses of a vitamin A concentrate to the ration gave questionable results, definitely less satisfactory than those obtained by feeding the machine-dried alfalfa or carrots. It seems apparent that these last-named feeds carry a factor or factors necessary for the production of milk of good flavor, and that a lack of these results in certain off-flavors. While this factor is not definitely identified, carotene seems to be very important in this connection.

The bacteriological grading of milk, G. S. Wilson et al. (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 206 (1935), pp. 392, figs. 29*).—This extensive report gives a full account of a critical inquiry into the validity of the methods available for bacteriological examination and grading of milk. Based on experimental evidence obtained in the course of this study, the authors point out the shortcomings of the plate count, the coliform count, and other common tests used in determining the sanitary quality of milk. A modification of the methylene blue reduction test is described, and results are presented to indicate that it is particularly well adapted for grading milk as to its suitability for human consumption.

Preservation of milk by gas pressure, A. C. Dahlberg (*Farm Res. [New York State Sta.], 3 (1937), No. 2, p. 14*).—The author points out the similarity between the process, recently patented in Germany, of preserving milk by subjecting it to a pressure of approximately 150 lb. per square inch by oxygen gas and the process reported by the New York State Experiment Station 29 yr. ago (E. S. R., 19, p. 573), the principal difference being the use of carbon dioxide instead of oxygen in the latter. In view of the similar results obtained by these methods, it is suggested that the pressure involved rather than the presence of a specific gas is the main factor in inhibiting bacterial growth. Either process is considered to have a very limited practical application.

Methods of caring for farm separators and their influence upon the quality of cream, C. K. Johns (*Sci. Agr., 16 (1936), No. 7, pp. 373–390; Fr. abs., p. 390*).—When the separator bowl is held unwashed between the evening and morning separations at a temperature of 18° C. (64.4° F.), thorough flushing of the bowl with cold water following the evening separation and again prior to the morning separation reduces bacterial contamination from the bowl to a low figure, and a similar flushing with hypochlorite solution practically eliminates contamination.

When the bowl is held at 28°, however, such flushing will not prevent serious contamination of the cream, although hypochlorites are considerably more effective than cold water in this respect. It is shown that cream samples sour more readily than milk samples containing an equivalent bacterial content at 15.5°. Coliform organisms apparently had little influence on the rate of acid production at this temperature.

Cheese ripening studies (*Canad. Jour. Res., 14 (1936), No. 9, Sect. B, pp. 311–319; 320–324*).—Continuing this series, two additional studies are reported (E. S. R., 73, p. 235).

The influence of yeast extract on the types of streptococci found in starters, B. A. Eagles, O. Okulitch, and A. G. Campbell (pp. 311–319).—In this phase of the study an active lactic acid cheese starter was carried through 20 successive transfers in fresh skim milk alone and in the same skim milk enriched with 0.15 percent yeast extract. Suitable dilutions of each were then plated on peptonized milk gelatin and peptonized milk gelatin plus 0.15 percent yeast extract and incubated for 7 days, after which time cultures were isolated for further study. The most significant result of the yeast enrichment was the development of a much larger proportion of slow acid-producing strains of streptococci which had the ability to ferment the more complex carbon sources, including salicin, maltose, starch, dextrin, and sucrose. The strains of lactic acid streptococci isolated are described, including six new strains and one new species.

The influence of the configurational relations of the hexoses on the sugar-fermenting abilities of lactic acid streptococci, O. Okulitch and B. A. Eagles (pp. 320–324).—In this phase a vigorous strain of *Streptococcus cremoris* was used in inoculating broths containing fructose, glucose, mannose, galactose, sucrose, maltose, lactose, dextrin, starch, and salicin, respectively. Repeated serial transfers in each sugar broth were made at 48-hr. intervals, and at each transfer milk tubes were inoculated with each culture and the time required to clot the respective milk tubes determined. After a few transfers it is shown that certain of the sugars exerted an inhibitory influence on the rate and amount of acid production in milk. Glucose and salicin showed the strongest inhibitory effect, and after 11 transfers in either of these the organism completely lost its ability to ferment lactose, while mannose and fructose also exerted considerable inhibitory action. Galactose or lactose, while failing to inhibit this activity completely, did exert a restraining influence. It appears that the inhibitory activity of glucose or one of its metabolic products may be the cause of the sudden or gradual loss of vitality in the starters.

A comparison of pressure and centrifugal homogenization of ice cream mixes, J. C. Hening (*Jour. Dairy Sci., 19 (1936), No. 11, pp. 707–714, figs. 2*).—The New York State Experiment Station has studied the comparative effects of 2-stage homogenization (using various pressures on each stage) and centrifugal homogenization on the viscosity, average size of fat globules, and the degree of clumping of fat globules in ice cream mixes and the quality of the resulting ice cream. Pressure homogenization at 2,000–500, 1,200–400, and 900–300 lb. gave mixes very similar in viscosity and size of globules to those centrifugally homogenized. However, the former showed considerable clumping of the fat globules, whereas the latter contained no such clumps. When the mixes contained gelatin the resulting ice creams under each treatment were very similar in body and texture. When the mixes did not contain gelatin the range of treatments outlined above was not effective in increasing viscosity of the mix, and the resulting ice cream was coarse. The viscosity of the centrifuged mixes and the quality of the ice cream from such lots failed to equal that of the unhomogenized mixes. Higher homogenization pressures were effective in increasing the viscosity of mixes containing no gelatin. Data are presented on the effect of maintaining a constant pressure on each stage while employing a range of pressures on the other stage.

VETERINARY MEDICINE

History of veterinary medicine, E. Leclainche (*Histoire de la médecine vétérinaire. Toulouse: Office du Livre, 1936, pp. XV+812, [fig. 1]; rev. in Jour. Compar. Path. and Ther., 49 (1936), No. 2, pp. 181, 182*).—Part 1 considers the the origin of veterinary schools through the Middle Ages and the period of the

Renaissance (pp. 7–227); part 2, the modern veterinary schools and colleges (pp. 229–812).

Veterinary military history of the United States, with a brief record of the development of veterinary education, practice, organization, and legislation, I, II, L. A. Merillat and D. M. Campbell (*Kansas City, Mo.: Haver-Glover Labs., 1935, vols. 1, pp. 620, figs. 291; 2, pp. 621–1172, figs. 168; rev. in Vet. Med., 30 (1935), Nos. 10, pp. 457–460, 11, pp. 513–516; Jour. Amer. Vet. Med. Assoc., 87 (1935), Nos. 5, pp. 586–589, 6, pp. 684–686*).—Following an introduction (pp. 23–117), the several parts of volume 1 deal with the subject as follows: Prior to the Civil War, 1792–1860 (pp. 117–146); Civil War and reconstruction, 1861–79 (pp. 147–190); Army veterinarians civilian employees with enlisted status, 1879–1901 (pp. 191–340); Army veterinarians civilian employees with commissioned status, 1901–16 (pp. 341–470); and Army veterinary service, zone of interior, 1916–20 (pp. 471–620). Volume 2 takes up the veterinary service of the American Expeditionary Forces, 1916–20 (pp. 627–910), and the present Army Veterinary Corps, 1920–35 (pp. 911–976), followed by lists of Army veterinarians, 1866–1935 (pp. 977–1145).

Chapters have been contributed to volume 1 by J. P. Turner (pp. 267–278), C. J. Marshall (pp. 483–490), and C. E. Cotton (pp. 491–502) and to volume 2 by W. H. Wright (pp. 789–798).

Treatise on exotic veterinary and comparative pathology.—III, Sporadic diseases, intoxications, food deficiency diseases, etc., G. Curasson (*Traité de pathologie exotique vétérinaire et comparée.—III, Maladies sporadiques, intoxications, carences. Paris: Vigot Bros., 1936, pp. 614, figs. 3*).—In this third volume of the work previously noted (E. S. R., 75, p. 690), particular attention is given to poisonous plant intoxications, including an extended consideration of the toxic species by families and genera. Chapter 20 (pp. 544–602) complements volumes 1 and 2. Bibliographies accompany the several chapters.

Bernhard Bang: Selected works, edited by V. Adsersen (*København (Copenhagen): Levin & Munksgaard; London: Oxford Univ. Press, 1936, pp. XIV+560, pls. 7, figs. 4*).—This selection of the most important of the scientific works of the late B. Bang is presented in three groups, in each of which they are arranged in chronological order. The first (pp. 1–179) comprises Bang's investigations on a series of important animal diseases, including actinomycosis, mastitis in cattle, infections caused by the bacillus of necrosis, endocarditis in swine erysipelas, epizootic abortion, chronic bacterial enteritis in cattle (Johne's disease), and abortion due to tuberculosis; the second group (pp. 180–236) comprises his investigations on tuberculosis of the udder and on tuberculous milk; and the third group (pp. 237–560) comprises a selection of his works on tuberculin and its application by the method that he developed for combating tuberculosis in cattle.

Variations and diseases of the teeth of animals, F. Colyer (*London: John Bale, Sons & Danielsson, 1936, pp. VIII+750, figs. [1021]*).—Variations of the teeth in number and shape and in the position of the teeth of animals, considered systematically by orders, which take up the greater part of the work, are followed by accounts of the abnormal eruption of teeth, injuries of the jaw, injuries of the teeth, overgrowth of teeth, hypoplasia of the teeth, caries of the teeth, loss of the tooth tissue from causes other than caries, dento-alveolar abscess, progressive destruction of the tooth sockets—parodontal disease, and odontomes.

A rapid test for the detection of latent and clinical mastitis, G. C. Holm and D. F. Eveleth (*Vet. Med., 32 (1937), No. 1, pp. 20, 21*).—A description is given of a color test developed for the field diagnosis of both clinical and latent mastitis.

Rickettsias and rickettsioses [trans. title], L. BALOZET (*Rev. Gén. Méd. Vét., 45 (1936), No. 535, pp. 385–408, figs. 3*).—This contribution includes a tabulation of the known pathogenic forms of *Rickettsia* (15 in number), the diseases caused, their geographical occurrence, natural (so far as known) and experimental vectors, natural hosts, hosts experimentally susceptible, and serological reaction.

The incidence and pathology of tumours of domesticated animals in South Africa, C. JACKSON (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 6 (1936), No. 1, pp. 460, figs. 187*).—This contribution (E. S. R., 75, p. 538) reports upon a study of the Onderstepoort collection of neoplasms, with special reference to their histopathology.

A compendium of parasitology, I, II, E. BRUMPT (*Précis de parasitologie. Paris: Masson & Co., 1936, 5. ed., rev., vols. 1, pp. XII+1082, pls. 4, figs.* [576]; *2, pp. 1083–2139, figs.* [525]).—A completely revised and enlarged edition of the work previously noted (E. S. R., 48, p. 774).

***Cutaneous reactions and the diagnosis of parasitic diseases (nonbacterial)*,** J. CALLOT (*Réactions d'hypersensibilité cutanée et diagnostic des maladies parasitaires (non bactériennes). Paris: Vigot Bros., 1934, pp. 173*).—This review is presented with a 28-page list of references to the literature.

Synopsis of the helminths of domestic animals in Brazil [trans. title], C. PINTO and J. LINS DE ALMEIDA (*Campo* [*Rio de Janeiro*], *6 (1935), No. 8, pp. 54–63, figs. 11*).—This contribution includes annotated host lists of the helminth parasites of domestic animals in Brazil and a bibliography of 59 titles.

The effects of natural factors, rain and sun, on survival of eggs and larvae of animal parasites under tropical conditions, L. A. SPINDLER (*Puerto Rico Sta. Agr. Notes No. 74 (1936), pp. 4*).—Observations and experiments conducted by the U. S. D. A. Bureau of Animal Industry in cooperation with the station from May 14 to August 6, 1936, in which eggs of the swine roundworm *Ascaris suis* and the swine thorny-headed worm *Macracanthorhynchus hirudinaceus* were used, together with infective larvae of the swine kidney worm *Stephanurus dentatus*, the swine nodular worm *Oesophagostomum dentatum*, the sheep stomach worm *Haemonchus contortus*, the dog hookworm *Ancylostoma caninum*, and various undetermined species of horse strongyles (Strongylidae), are reported upon.

Most parasite eggs and larvae were found to die quickly on unshaded grassed areas, but disappeared sooner on bare soil partially shaded and even more rapidly on unshaded bare soil. The eggs of the swine roundworm were quickly killed by sunlight, while heavy rainfall cleared the pasture areas of the eggs and larvae. Horse strongyles were found only in and close to piles of manure. It appears that the utilization of sunlight and heavy rains is important in parasite control.

Disinfection and sterilization, E. C. MCCULLOCH (*Philadelphia: Lea & Febiger, 1936, pp. 525, figs. 53*).—This work is presented in 19 chapters, each of which is accompanied by a bibliography.

[Report of work in animal parasitology and pathology] (*California Sta.* [*Bien.*] *Rpt. 1935–36, pp. 90–97*).—The work of the biennium 1935–36 with diseases and parasites of livestock referred to (E. S. R., 72, p. 689) includes the use of tuberculin in the diagnosis of and of B. C. G. in vaccination against tuberculosis of cattle, whey tests for the diagnosis of and use of low virulent culture for calfhood (E. S. R., 75, p. 106) and swine vaccination against Bang's disease, tick transmission of (E. S. R., 75, p. 254; 76, p. 249) and intravenous injections of sodium cacodylate and glucose solution in treating cattle for anaplasmosis, vesicular exanthema of swine (E. S. R., 74, p. 392; 75, p. 101),

the seasonal incidence of *Ostertagia circumcincta* in sheep on irrigated pastures and the status and control of *Trichostrongylus axei* in sheep, vaccination of poultry for fowl pox (E. S. R., 75, p. 110), infectious coryza of poultry (E. S. R., 76, p. 697), pullorum disease (E. S. R., 73, p. 396), a protozoal disease of poultry a cause of poultry mortality, and the tick *Ornithodoros hermsi* known to be a vector of human relapsing fever (E. S. R., 74, p. 695; 76, p. 370).

Animal diseases (*West Virginia Sta. Bul. 278 (1936), p. 8*).—Brief notes are given on the negative effect on pigs of vitamin A in the ration as regards susceptibility to infestation by roundworms and on the use in sheep of copper sulfate for control of gastrointestinal parasites and of an oil extract of pyrethrum for lungworms.

[The fourth report of the director of the Institute of Animal Pathology, University of Cambridge, 1934–35] (*Cambridge Univ., Inst. Anim. Path. Rpt. Dir., 4 (1934–35), pp. 1–102, 212–304, pls. 13, figs. 8*).—Contributions presented in this fourth report (E. S. R., 70, p. 825) are as follows: Contagious Pustular Dermatitis of Sheep: Vaccination, by R. E. Glover (pp. 1–15); Observations and Experiments With Myxomatosis Cuniculi (Sanarelli) to Ascertain the Suitability of the Virus to Control the Rabbit Population, by C. J. Martin (pp. 16–38); Fowl Paralysis—I, The Results of an Investigation Into Thirty-Eight Outbreaks, by F. Blakemore (pp. 39–50), and II, Experiments on Transmission, by F. Blakemore and R. E. Glover (pp. 51–64); The Persistence of *Brucella* in the Aborted Foetus and Its Membranes (pp. 65–71) and Examination of Faeces and Urine of Cows for the Presence of *Brucella abortus* (pp. 72–78), both by T. J. Bosworth; The Effect on *Cl[ostridium] welchii* Toxins of a Substance Present in the Normal Intestine, by T. J. Bosworth and R. E. Glover (pp. 79–93); Avian Tuberculosis in Cattle, by R. E. Glover and A. S. Griffith (pp. 94–102); Some Observations on the Physiological Actions of *Cl[ostridium] welchii* Toxins, by J. A. Nicholson (pp. 212–226); The Pathology of "Swayback", a Congenital Demyelinating Disease of Lambs With Affinities to Schilder's Encephalitis, by J. R. M. Innes (pp. 227–250); Preliminary Experiments in Calves on the Immunity Conferred by the Subcutaneous Inoculation of *Mycobact[erium] tuberculosis* in Oily Excipients, by J. B. Buxton and R. E. Glover (pp. 251–261); Duration of the Immunity Produced in Calves by the BCG Vaccine, I, by J. B. Buxton, R. E. Glover, and A. S. Griffith (pp. 262–279); and The Effects of Some Natural Factors on the Second Ecdysis of Nematode Infective Larvae, by G. Lapage (pp. 280–304).

Studies on aseptically drawn milk from Bang's disease positive and Bang's disease negative cows, H. B. Morrison and F. E. Hull (*Jour. Dairy Sci., 19 (1936), No. 7, pp. 432, 433*).—In continuation of their work in Kentucky (E. S. R., 74, p. 257) the authors report upon a study in two commercial dairies, samples being secured from each quarter of the udders of 184 cows.

A comparison of the (1) bromothymol blue reaction, (2) leucocyte content, (3) agglutination, and (4) examination for the presence of streptococci, made on the same sample, showed "the largest group among the positive cows to be positive to all four tests and the largest group from the negative cows to be negative to all four tests. It appears from these results that cows positive to Bang's disease are subject to considerably more udder trouble than cows negative to Bang's disease. The results secured from these herds indicate that proper care and management of herds containing Bang's disease positive and negative cows may influence the amount of udder trouble to a considerable extent."

The vaccinal immunization of cattle for Bang's disease, D. B. Meyer and I. F. Huddleson (*Michigan Sta. Tech. Bul. 153 (1936), pp. 25*).—The results of a 5-yr. study of a vaccine made from a selected nonvirulent strain of *Brucella*

abortus in cattle of an age varying from a few weeks to many years and situated in farm herds, conducted from 1929 by the U. S. D. A. Bureau of Animal Industry and the station cooperatively, are presented, the details being given in tables. The particular culture used is said to have been studied intensively as to its virulence and immunizing value at the station since 1921.

"During the study there was no evidence obtained of any harmful effects resulting from the vaccine on the breeding efficiency or milk production of the animals. Furthermore, it has been found that the strain of *B. abortus* used in the vaccine is nonpathogenic for human beings. Data pertaining to the effectiveness of the vaccine in immunizing cattle against infection from *B. abortus* have been analyzed mathematically using the $(chi)^2$ equation for testing independence. A $(chi)^2$ value of 24.5 was obtained by solving the equation. A number as great as this is proof that there is a significant difference in the incidence of infection in the vaccinated animals and those in the control groups. The presence of *Brucella*-immune opsonins in high titer in the blood of cattle indicates the degree of active immunity against Bang's disease."

The incidence of streptococcic mastitis among dairy cattle, C. S. Bryan (*Vet. Med., 32 (1937), No. 2, pp. 70–74; Ger., Fr. abs. p. 74*).—In a survey made by the Michigan Experiment Station covering 322 herds of a typical milkshed, 86 percent of all the herds had streptococcic mastitis and 26.2 percent of all milking cows tested were infected with the streptococci of mastitis. The incidence of infection was not influenced by the size of the herd, for some large and some small herds were found to have a high percentage of cows infected and others had a low incidence of infection.

Do all bovine udders contain mastitis organisms? G. J. Hucker (*Farm Res. [New York State Sta.], 3 (1937), No. 2, p. 2*).—In a search for the original source of the mastitis organism, about 50 udders were removed aseptically from cows and heifers and determined by post mortem not to show any changes in the tissue which would indicate the presence of mastitis. By special laboratory manipulations, these udders were cultured and it was found possible to isolate one of the mastitis streptococci (of which there are three known types or varieties) from every udder which had passed through one or more lactation periods. It would appear that all cows which have passed through a lactation period carry these mastitis organisms embedded in the udder tissue. Active infection is set up only when the cow's resistance is lowered by injury or other cause.

A report on a control program for bovine infectious mastitis based on segregation of infected animals, E. O. Anderson and W. N. Plastridge (*Jour. Dairy Sci., 19 (1936), No. 7, p. 432*).—In further work with infectious bovine mastitis (E. S. R., 75, p. 845), data collected before and after the adoption of the program of segregation based upon periodic examinations, chiefly bacteriological, and segregation of animal shedding streptococci identified as *Streptococcus agalactiae* by the method previously noted (E. S. R., 76, p. 249) are reported upon.

Infectious bovine mastitis: Report on a control program based on segregation of infected animals, W. N. Plastridge, E. O. Anderson, F. J. Weirether, and R. E. Johnson (*Jour. Dairy Sci., 19 (1936), No. 10, pp. 641–650*).—This contribution from the [Connecticut] Storrs Experiment Station reports further (see above) upon a control program, a description of which has been noted (E. S. R., 73, p. 104). By the use of this segregation plan the annual rate of spread of infectious streptococcal mastitis in herds may be reduced from 50 to 100 percent. While the rate of spread of infection is materially reduced by segregating infected animals at one end of the milking string and milking them last, complete separation is necessary to prevent entirely the spread of infec-

tion. Herds free from *Streptococcus mastitidis* (group A) (=*S. agalactiae*) may be established by segregation of the normal animals, disposal of infected individuals, and replacement by first calf heifers that have not been exposed to infection following parturition. The results presented support the opinion that it is possible to establish and maintain a herd free from the organism generally recognized as *S. agalactiae*.

Production of white spotted kidneys in calves, L. A. Moore and E. T. Hallman (*Jour. Dairy Sci., 19 (1936), No. 7, pp. 434, 435*).—The authors have found that "when calves at 30 days of age are placed on a ration of skim milk, cornstarch, bran, yeast, mineral, or similar rations which are low in their vitamin A content, so-called white spotted kidneys develop in many of the calves. During the past 4 yr. some 30 cases have been noted on autopsy. Macroscopically and microscopically the lesions are similar to those previously described which develop when colostrum is withheld from the newborn calf. The condition is also associated with the development of pneumonia and scours.

"The calves usually come to autopsy at from 90 to 150 days of age. The feeding of carotene in the form of 'caritol' seems to possess some preventative properties which would indicate that the condition may be related to vitamin A deficiency. Experiments are now in progress to establish the deficiency."

A treatment for scours in calves, J. N. Shaw and O. H. Muth (*North Amer. Vet., 17 (1936), No. 7, pp. 35–38*).—In work at the Oregon Experiment Station, *Lactobacillus acidophilus* milk cultures proved successful in bringing about a rapid recovery in 34 cases of dysentery in calves. Four cases failed to show any but temporary improvement, and 12 cases apparently were not influenced in any way by culture milk.

***The internal parasites and parasitic diseases of sheep: Their treatment* and control,** I. Clunies Ross and H. McL. Gordon (*Sydney: Angus & Robertson, 1936, pp. XX+238, pls. 46, figs. 35*).—Following a brief introduction, section 1 of this work on sheep parasites of major economic importance deals with the trematodes and cestodes (pp. 1–66), section 2 with the nematodes (pp. 67–185), and section 3 with the collection and preservation of parasites and method of diagnosis in the living animal (pp. 186–208). Reference is made to the parasites of rabbits and Australian native fauna—their relationship to parasitic infection in sheep—in an appendix. A glossary of terms, a five-page list of references to the literature, and an index are included.

The Nemathelminthes of sheep, M. Crombée-Langerand (*Les Némathelminthes du mouton. Thesis, Univ. Paris, 1935, pp. 104, figs. [32]*).—A brief introduction to the study of the roundworms of sheep, their morphology, biology, and classification, and a report upon such parasites, their habits, importance, etc., are followed by an account of preventive and control measures.

Tuberculosis in milk goats, O. C. Cunningham and L. H. Addington (*Jour. Dairy Sci., 19 (1936), No. 7, p. 435*).—In tuberculin tests made in 1931 of a herd of milk goats kept by the New Mexico Experiment Station for breeding purposes, two reacted and were removed from the herd. Both of these on post mortem showed pronounced tubercular lesions. Since 1931 five more goats have been removed from the herd as a result of applying the intradermal tuberculin test. One of these on post mortem showed pronounced tubercular lesions and three others minor lesions that may have been tubercular.

The authors consider it highly desirable that goats kept for the production of milk for human consumption be tested for tuberculosis the same as are dairy cattle.

The importance of the dilution fluid when testing with mouse the virulence and vitality of the swine-erysipelas bacillus, P. Vimmén (*Skand. Vet. Tidskr., 26 (1936), No. 8, pp. 509–514; Eng. abs., pp. 513, 514*).—The author has

observed in diluting bouillon cultures of the swine erysipelas bacillus with a physiological sodium chloride solution that the virulence of the culture diminishes more rapidly than if the dilution medium consists of bouillon with the pH value 7.6, or if such a bouillon is diluted with physiological sodium chloride solution in the proportion of 1 part bouillon plus 4 parts of sodium chloride solution. In the course of many experiments it was found that the swine erysipelas bacillus in the bouillon culture often succumbed on dilution with sodium chloride solution, but that it did not on dilution with bouillon or with bouillon diluted in the manner above described.

Contribution to the study of Stephanurus dentatus Diesing 1889, the etiological agent of stephanurosis of swine [trans. title], C. Pinto (*Campo [Rio de Janeiro], 6 (1935), No. 11, pp. 27–30, figs. 3*).—This account of the kidney worm of swine is accompanied by a list of 40 references to the literature.

Meningoencephalomyelitis of the horse: Enzootic encephalitis, infectious encephalomyelitis, Borna disease [trans. title], L. Panisset (*Rev. Gén. Méd. Vét., 45 (1936), Nos. 532, pp. 193–207; 533, pp. 257–277, figs. 8*).—A review of the present knowledge of this disease of the horse in its several forms is presented with a seven-page list of references to the literature.

Studies on so-called cornstalk disease in horses.—IV, Toxic encephalitis or non-virus encephalitis, R. Graham and B. Harris (*Vet. Med., 31 (1936), No. 8, pp. 340–346, figs. 6; Ger., Fr. abs., p. 345*).—Reporting further (E. S. R., 73, pp. 393, 543; 75, pp. 258, 692) reference is made to one natural case of acute equine cornstalk disease in which encephalomalacia was encountered, *Pasteurella* micro-organisms being isolated from the brain tissue suspension as well as from liquid cultures of the brain tissue suspension through animal inoculation. Rabbits, guinea pigs, and pigeons received the tissue and culture inoculum, while the cultures isolated were successfully passed through rabbits, guinea pigs, and pigeons. Direct cultures of the horse brain tissue suspension on solid medium (plain agar plates) proved negative to *Pasteurella* micro-organisms upon animal inoculation.

In one peracute natural case of cornstalk disease showing encephalomalacia. *Pasteurella* micro-organisms were isolated directly from the heart blood. Animal inoculation of the liquid culture of the blood yielded *Pasteurella* micro-organisms in 20 percent of the animals inoculated.

"A composite spleen, thymus, heart, and lung suspension upon injection into rabbits, guinea pigs, and pigeons did not yield *Pasteurella* micro-organisms, while liquid cultures of the lungs, spleen, thymus, and pericardial fluid upon animal inoculation proved negative to *Pasteurella* micro-organisms. From the same animal liquid cultures of the peritoneal fluid, spinal fluid, and brain yielded *Pasteurella* micro-organisms. Intracerebral inoculation of the brain tissue suspension of this animal yielded *Pasteurella* micro-organisms from only 1 guinea pig, though a total of 12 received the inoculum with a 66⅔ percent mortality."

True equine piroplasmosis [trans. title], P. Rossi (*Rev. Microbiol. Appl., 2 (1936), No. 4, pp. 173–188*).—This is a report of clinical observations and of hematological and therapeutic studies, presented with a list of 35 references.

The etiology of helminth aneurisms and strongylosis of equines [trans. title], C. Pinto and C. Proença (*Campo [Rio de Janeiro], 7 (1936), No. 79, pp. 53–56, figs. 7; Eng. abs., p. 56*).—Helminths found in affected horses in Brazil include *Strongylus edentatus*, *S. vulgaris*, *S. equinus*, and *Trichonema goldi* (recorded for the first time from Brazil).

Diseases of fur bearing animals, A. C. Secord (*Vet. Med., 31 (1936), No. 12, pp. 532–549, figs. 5*).—The more important diseases and parasites of fur-bearing animals are considered.

[**Contributions on diseases of poultry**] (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 20 (1935), pp. 378, 379, 380–400*).—Contributions on diseases of poultry include the following: Economic Aspects of Mortality in Poultry, by C. R. Davis (pp. 378, 379); Diet and Disease in the Domestic Fowl, by H. Bunyea (pp. 380–385); Breeding and Disease in the Domesticated Fowl, by G. D. Quigley (pp. 385–389); and History of Diseases in the Domestic Fowl, by R. H. Waite (pp. 389–400).

Diseases of poultry, J. Reis, P. Nobrega, and A. S. Reis (*Tratado de doenças das aves. São Paulo, Brazil: Inst. Biol., 1936, pp. [8]+468+[1], pls. 4, figs. [362]*).—The diseases and parasites of poultry are dealt with according to their etiology as follows: Filtrable viruses (pp. 1–91), bacteria (pp. 92–207), fungi (pp. 208–233), protozoa (pp. 234–311), helminths (pp. 312–352), arthropods (pp. 353–385), nutrition (pp. 386–407), and organic alterations (pp. 408–438). A list of references to the literature accompanies the account of each disease.

Occurrence of diseases in poultry, S. Wall (*Skand. Vet. Tidskr., 26 (1936), No. 7, pp. 477–497; Eng. abs., pp. 495–497*).—The occurrence of diseases of poultry in Sweden, based upon examinations of 4,419 fowl from 1925 to 1935, is reported upon.

A Pentatrichomonas associated with certain cases of enterohepatitis or "blackhead" of poultry, E. A. Allen (*Amer. Micros. Soc. Trans., 55 (1936), No. 3, pp. 315–322, figs. 8*).—A description is given of a trichomonad of the genus *Pentatrichomonas* which has been observed during a period of 6 yr. in turkeys, chickens, and guinea fowls in cases that showed pathological changes closely resembling those of blackhead and in cultures made from such cases. This flagellate was grown in cultures isolated from the ceca of infected birds.

"Following the feeding of cultures of the *Pentatrichomonas*, isolated from the ceca of infected poults, to turkeys, the birds developed lesions in the liver, and two turkeys, which died, had typical blackhead lesions in the ceca. A saturated solution of thymol added to iodine-eosin caused the flagella of the organisms to spread out, so that the counting of flagella was greatly facilitated. Quinanil, 1:10,000, reduced bacterial growth in the cultures.

"The evidence presented in this study indicates that various contentions that have appeared in the literature in regard to the etiology of 'blackhead' may have justification, in that it is probable that each of two species of flagellates, *H[istomonas] meleagridis* and a species of *Pentatrichomonas*, may produce similar lesions in the liver and ceca of poultry."

A list is given of 11 references to the literature.

Fowl cholera: Pasteurella aviseptica—behaviour and immunization, comparison with P. suiseptica, Z. Morcos and A. Hosny Mahmoud (*Vet. Jour., 92 (1936), No. 9, pp. 336–339*).—The authors have found *P. aviseptica* and *P. suiseptica* to be morphologically and culturally indistinguishable. *P. aviseptica* is highly pathogenic to fowls and practically nonvirulent to guinea pigs on subcutaneous inoculation, while *P. suiseptica* is not pathogenic to fowls and is virulent to guinea pigs. Formalin or carbolic acid on addition to *P. aviseptica* broth cultures does not interfere with vaccine, while heating seems to interfere with the antigenic properties.

Coryza of fowls, G. Kernohan (*Nulaid News, 14 (1936), No. 6, pp. 6, 7*).—A discussion of the respiratory affections of the fowl.

The transmission of fowl-pox, A. L. Brody ([*New York*] *Cornell Sta. Mem. 195 (1936), pp. 37, pls. 3*).—Following a brief consideration of the methods by which fowl pox is spread, experiments on the transmission of the disease by contact and by intermediate hosts are reported upon at length, the details being

given in tables covering 15 pages. The following methods of spread are considered to have been proved:

"Direct contact between diseased and healthy birds is one certain method by which fowl pox is spread within a flock. By contact the virus may spread not only to the epidermis of the head but also to the mucous membrane lining the oral and associated cavities. Non-blood-sucking flies of the family Calliphoridae probably do not transmit fowl pox. This conclusion is drawn from observations recorded in the foregoing pages and from unrecorded observations. *Aedes stimulans* may transmit pox by intermittent feeding. This insect may also harbor viable virus in or on its body for at least 2 days following the infective meal. *A. aegypti* can definitely transmit the disease more than once during its life. Mosquitoes which had been able to transmit the disease within 1 hr. after their infective meal were still able to transmit it from 39 to 41 days later. The inoculation of the bodies of mites (*Liponyssus silviarum*) 4 days after their last association with a diseased bird, produced pox on a susceptible bird. Adult mites when fed on a healthy bird 4 and 11 days after their last association with a diseased bird did not cause pox. Mosquitoes can best transmit the disease if they feed on pox lesions which are [from] 5 to 17 days old. (This conclusion is based in part on work with *Aedes vexans* and *A. aegypti* not reported in this paper.) The virus remains viable on inanimate objects for at least 42 days. In these experiments the virus could not be demonstrated on inanimate objects 61 days after contamination.

"The virus may be found in or on any part of the body of an infected mosquito during the first 3 days of the incubation period. By the fifth day at least the virus localizes in or on the proboscis and the head. The virus can still be found in or on the proboscis or the head, or both, for at least 15 days even when the insect has fed on three birds during that period."

There is said to be definite evidence that the fowl pox may arise at previously uninjured areas of the comb, although the greater number of lesions will arise at injured areas.

A list of 20 references to the literature is included.

Observations on fowl paralysis (lymphomatosis), T. Dalling and G. H. Warrack (*Vet. Jour., 92 (1936), No. 9, pp. 310–321*).—The authors' investigations have led to the conclusion that lesions of lymphomatosis may be found in practically all tissues, including those of the nervous system, and that they may occur only in the nervous tissues or in other tissues or in both in the same bird. "Intestinal parasitic infestation plays no essential part in the causation of lymphomatosis in fowls. Clinical and histological evidence of lymphomatosis may be found in fowls at ages varying from 2 to over 38 mo. In the older affected birds there is evidence that the condition did not occur at an earlier age. There is some evidence that the injection of tissues from affected birds into healthy normal stock may play a part in transmitting lymphomatosis. Much seems to depend on the type of bird injected; some strains appear to be more readily susceptible than others. In some birds the injection of tissues from healthy birds seems to be followed by the occurrence of lymphomatosis. There is no evidence that lymphomatosis is transmitted by contact of potentially affected chicks or affected adults with healthy young chicks.

"Breeding experiments carried out in 1934 lead us to conclude that incubation and rearing play no part in the causation of lymphomatosis, for all hatches were treated similarly and the incidence in them did not differ materially."

Epidemic tremors (trembling chick disease), C. A. Bottorff, A. E. Tepper, C. L. Martin, T. B. Charles, and F. D. Reed (*New Hampshire Sta. Circ. 51*

(1936), pp. 8).—This contribution, following a brief history of the disease first described by Jones in 1932 (E. S. R., 69, p. 112) and again in 1934 (E. S. R., 71, p. 702), reports upon transmission experiments, breeding and management studies, and the clinical history of epidemic tremors. This is an affection of the nervous system of poultry that results in a distinct and rapid tremor of the head and neck and in some cases the tail, and in a majority of which there is an ataxia, with a mortality running from 0 to 65 percent.

The transmission studies conducted, which included the placing of affected and nonaffected chicks together and intracranial inoculations of brain suspensions from affected chicks, failed to indicate how the disease is spread. The results of the breeding studies indicate that the disease is not hereditary. It occurred under four different types of brooding systems where normal brooding conditions were maintained; it also occurred in chicks fed all types of feed of varying protein level. Variations in incubation or hatching temperatures were not found to be a cause under the conditions observed. The affected birds studied showed no significant difference in body temperatures or blood counts. Attempts at treatment proved to be valueless.

Contribution to a study of pullorum disease of the fowl, M. FERREOL (*Contribution a l'étude de la diarrhée blanche bacillaire des poussins. Thèse Inaug., Univ. Zurich, 1935, pp. 79, pl. 1, figs. 2*).—This contribution reports upon the clinical symptoms, pathology, epidemiology, occurrence in Switzerland, economic importance, and organization of control work against pullorum disease, presented with a list of 69 references to the literature.

The pullorum-gallinarum group in comparative bacteriological tests, G. PACHECO and C. RODRIGUES (*Mem. Inst. Oswaldo Cruz, 31 (1936), No. 3, pp. 591–654, pls. 8; Eng. trans., pp. 655–705*).—In the course of the work here reported 38 strains of the *Salmonella pullorum-S. gallinarum* group of microorganisms from Europe, North America, and Brazil were investigated to determine the fixity of their properties and the possibility of transforming one strain into another. Five types were recognized, namely, (1) gasogenic pullorum, (2) nongasogenic pullorum, (3) intermedius, (4) gasogenic gallinarum, and (5) nongasogenic gallinarum. A table which summarizes the more important characteristics of the five types, the first two and the last of which have been well known and recognized by specialists, the third was recognized by the author in 1935, and the fourth by Beck and R. Eber[1] in 1927, is included. The changes produced on neutral red, H_2S production, fermentation of glycerol, isodulcitol, xylose, dulcite, sorbitol, and maltose, activity upon Seignette salt, gas production, and appearance of the colonies are among the characteristics on which the distinction of these five types is founded.

"The gasogenic gallinarum type, on account of its action on sorbitol and xylose, and also on Jordan's medium, must be rather considered as a gasogenic intermedius type. Other biological characteristics, such as activity upon milk, milk whey, dextrin, etc., accepted by several specialists, appeared as of no practical value to the distinction of the different types of our strains. The strains kept their properties invariable during all the time of our investigations. The hypothesis of a possible transformation of one type into another has not been confirmed in any of the studied strains, and this justifies the idea of independence of each one of the accepted types. Some discrepancies in fermentation of maltose, as found by several authors in micro-organisms of this group, have been not confirmed in this paper. In blood horse serum a factor capable of transforming maltose was found making it fermentative. This substance is thermostable and resistant to some antidiastatic substances. The sero-

[1] Arch. Wiss. u. Prakt. Tierheilk., 56 (1927), No. 2, pp. 121–140, figs. 3.

logical analysis of the studied strains did not allow an antigenic distinction among the different types of the bacterial group."

A six-page list of references is included.

The present status of pullorum disease in turkeys, W. R. HINSHAW (*Nulaid News, 14 (1936), No. 8, pp. 10, 11*).—Data obtained at the California Experiment Station have led to the conclusion that "baby turkeys (poults) are as susceptible to pullorum disease as are baby chicks, and show the same manifestations. The chief source of infection in poults is in the hatchery where turkey eggs and chicken eggs are hatched in the same incubator. Survivors from an acute outbreak apparently have a greater ability to absorb the infection than do chickens, and consequently fewer permanent carriers remain in the flock. Prevention of pullorum disease in turkey flocks can best be accomplished by the use of separate incubators for hatching turkey eggs and by avoiding all contact with chicks, either in the hatchery or in the brooder. In the light of our present knowledge, a general testing program for turkeys is probably not justifiable. Flocks that have accidentally become infected should be tested, however, if they are to be used for the production of hatching eggs."

Ectoparasites and bird diseases, C. M. HERMAN (*Bird-Banding, 7 (1936), No. 4, pp. 163–166*).—The relation of ectoparasites to the transmission of avian diseases is reviewed.

Experiments in the treatment of poultry parasites in Puerto Rico, W. H. WRIGHT (*Puerto Rico Sta. Agr. Notes No. 73 (1936), pp. 7*).—Observations of the internal parasites of poultry from January 6 to April 2, 1936, and the results of the administration of anthelmintics for their control, conducted by the U. S. D. A. Bureau of Animal Industry and the station, are reported upon.

Seven species of nematodes, namely, *Capillaria annulata*, *Tetrameres americana*, *Cheilospirura hamulosa*, *Strongyloides avium*, *Ascaridia galli*, *Capillaria retusa*, and *Heterakis gallinae*; five species of tapeworms, including *Davainea proglottina*, *Amoebotaenia sphenoides*, *Hymenolepis cantaniana*, *Raillietina tetragona*, and *Raillietina* sp.; and a trematode (*Postharmostomum* sp.) were found in island poultry. Gentian violet, azamine, brilliant green, and mercurochrome (220 soluble) showed more or less promise for the removal of certain species of tapeworms from poultry. Gentian violet in repeated treatments also proved of value for the control of *S. avium*.

Effects of sulphur on coccidiosis in chickens, C. A. HERRICK and C. E. HOLMES (*Vet. Med., 31 (1936), No. 9, pp. 390, 391*).—In work at the Wisconsin Experiment Station flowers of sulfur added to the dry mash and hopper fed prior to infection with coccidia has been found to be effective not only in reducing but also in preventing the effects of coccidia on chickens under experimental conditions. When fed for only 2 days before infection there was little if any effect of the sulfur on the coccidia, but when the sulfur was administered for 4 days before infection was established its effect was marked. The mortality was 42, 22, and 19 percent, respectively, for the controls and those receiving 10 and 20 percent sulfur. When 20 percent sulfur was fed for a period of 6 days there was a reduction in the severity of the lesions and no mortality from an infection of coccidiosis which was fatal to 70 percent of those that were not given sulfur. The feeding of 10 percent sulfur, although preventing visible lesions in one-third of those treated, did not prevent all mortality.

It is concluded that much work remains to be done before the method can be recommended as a practical means of controlling coccidiosis. There was no evidence that the administration of sulfur has any curative effect on coccidiosis in poultry after the infection has become established.

Disinfection of poultry yards, E. C. McCulloch (*Vet. Med., 31 (1936), No. 9, pp. 386–389*).—This discussion, which is based upon the work previously noted (E. S. R., 75, p. 699) and a review of the literature, is presented with a list of 20 references.

Ovarian cyst in a parrakeet, A. J. Durant (*Vet. Med., 32 (1937), No. 2, p. 75, fig. 1*).—This is a case report from the Missouri Experiment Station.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the California Station] (*California Sta. [Bien.] Rpt. 1935–36, pp. 3–8, 10, 11, 127–132*).—Progress results are briefly presented of investigations on soil and water conservation, drainage, lowering of peat lands, irrigation by portable sprinklers, efficiency of irrigation pumping plants, ethylene treatment and dehydration of walnuts, machinery for lima beans and sugar beets, blowers for frost protection, and air cleaner performance.

[Agricultural engineering investigations by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 73, 135*).—The progress results are briefly presented of investigations on milk-cooling equipment, by H. W. Riley, B. A. Jennings, and H. J. Brueckner; milk-house construction and equipment, by Jennings, Riley, M. W. Nixon, and Brueckner; and air-conditioning in poultry houses, by G. O. Hall and F. L. Fairbanks.

Ground water in Gila and San Simon Valleys, Graham County, Arizona (*U. S. Dept. Int., 1936, P. N. 128150, pp. 2*).—This mimeographed leaflet gives a brief account of the ground water resources of these two valleys.

Improving drain tile resistance to alkali conditions, D. G. Miller (*Agr. Engin., 17 (1936), No. 12, pp. 513–515, 544, figs. 3*).—This paper is based on results of observations of experimental concrete specimens subjected to artificial sulfate solutions in the laboratory and to the behavior of specimens installed under natural field-exposure conditions in Minnesota and North Dakota and in Medicine Lake, S. Dak. The salt content of the lake ordinarily averages about 5 percent, with an extreme around 12 percent during 1934 and 1935. About two-thirds of the salts are magnesium sulfate and one-fourth sodium sulfate. For this work over 60,000 2- by 4-in. cement-concrete and cement-mortar cylinders, 4,000 specially made concrete draintile, and numerous miscellaneous specimens were used. The studies are cooperative between the Minnesota Experiment Station, the Minnesota State Department of Conservation, and the U. S. D. A. Bureau of Agricultural Engineering.

It was found that under identical exposure conditions concrete made of a highly resistant portland cement may last 10 times as long as that made of a cement of low resistance. Resistance of concrete is markedly increased by curing in water vapor at temperatures of from 212° to 350° F., almost to the point of immunity for the most favorable temperatures and curing periods. Resistance is not increased, however, by raising the curing temperatures until 212° is reached, except in connection with certain admixtures.

Apparently about equal resistance is secured by curing for the time periods and temperatures as follows: 212° for 8 days, 230° for 4 days, 260° for 2 days, 285° for 1 day, 315° for 12 hr., and 350° for 6 hr.

Calcium chloride used as admixture in concrete cured in water vapor at temperatures between 100° and 155° appreciably increases resistance, but check tests are too limited as yet to justify specific recommendations.

It is pointed out that, regardless of all other factors, care should be observed in all particulars to obtain the highest practicable 28-day strength with any given cement and any predetermined condition of curing. Strength, although

fallible for comparing different concretes, has much value as an index of the permeability and sulfate resistance of the products made of the same cement and by the same methods of manufacture. This is particularly true where rich mixes are used as is the case in the manufacture of high quality draintile.

Soil defense in the Piedmont, E. M. ROWALT (*U. S. Dept. Agr., Farmers' Bul. 1767 (1937), pp. IV+63, figs. 31*).—This deals in a popular manner with erosion of the soil and measures of defense which have proved successful in controlling erosion in that part of the Piedmont country lying in the States of Virginia, Georgia, Alabama, and the Carolinas. Control measures involve terracing, contour tillage, strip cropping, rotation with close-growing crops, and contour furrowing in pastures.

Cost of terracing with power equipment, D. G. CARTER and W. C. HULBURT (*Agr. Engin., 17 (1936), No. 12, pp. 511, 512, fig. 1*).—In a brief contribution from the Arkansas Experiment Station cost data are reported based upon an analysis of 240 terracing jobs in 7 Arkansas counties where 40-hp. Diesel tractors operating 10-ft. blade terracers are in operation.

Soil improvement associations were organized in each of these counties to handle the equipment. Work included typical terrace construction, usually "seven-cut" or three and one-half rounds of the machine, and built according to the usual recommendations for vertical interval, grade, width, and cross section. The associations are required to make a uniform charge of $3 per hour to the landowner for the use of the equipment and the operating crew. This charge is made for the time the tractor is in actual operation, but includes the service of surveying the field and laying out the terrace lines. The 240 jobs required 2,216.35 hr., the acres terraced amounted to 6,670, and the net average cost per acre was 99.7 ct. From data on lineal distances the costs are indicated as 33.8 ct. per 100 ft. of terrace. For the jobs analyzed the operating costs amounted to $4,312.12, or 64.6 ct. per acre, or 21.9 ct. per 100 lineal feet of terrace. The hourly operating cost totaled $1.95.

Thermal expansion of typical American rocks, J. H. GRIFFITH (*Iowa Engin. Expt. Sta. Bul. 128 (1936), pp. 36, figs. 21*).—This bulletin reports research the purpose of which was to determine the coefficients of expansion of typical American rocks of the type used for building purposes through the moderate ranges of temperature usually encountered in building practice. Approximately 100 representative American rocks of varying chemical constitutions and diversified geographical locations were included in the study.

The expansions appear to be dependent upon the amounts of free silica in the rocks; the rocks having a maximum of free silica expand the most, and those with a maximum of combined silica expand the least.

There was a lack of conclusive evidence of the presence of inversions as indicated by inflections in the thermal expansion curves. Discontinuities in slopes of curves for natural silicates appear to arise from several structural discontinuities such as minute cracks or slip planes in specimens. The inversions appear to occur through a range of temperatures rather than abruptly at the theoretical 220° C. expected.

An appendix includes thermal expansion curves.

Strength, absorption, and resistance to weathering of common and face brick manufactured in Virginia, J. W. WHITTEMORE and P. S. DEAR (*Va. Engin. Expt. Sta. Bul. 26 (1936), pp. 32, figs. 2*).—The purpose of this investigation was to assemble authoritative information regarding the merits of Virginia manufactured bricks and their classification according to the latest tentative specification for the American Society of Testing Materials.

Of the bricks submitted as salable by the manufacturers, 95.5 percent represent bricks that are hard and well-fired, 95.5 percent represent bricks that are

resistant to weathering, 73.3 percent are suitable for use where exposed to severe weathering such as severe frost action, and 17.7 percent additional are suitable where exposed to ordinary weathering conditions. On the basis of strength alone, all of the bricks submitted pass the minimum requirements of the A. S. T. M. specifications.

The influence of the character of the petroleum on the initial toxicity to wood destroying fungi of creosote-petroleum mixtures, H. SCHMITZ (*Amer. Wood-Preservers' Assoc. Proc., 32 (1936), pp. 145–166, figs. 9*).—Studies conducted at the Minnesota Experiment Station are reported.

The initial toxicity of creosote-petroleum mixtures appears to be influenced not only by the initial toxicity of creosotes entering such mixtures but also by the character of the petroleum in the mixture. Mixtures of petroleums of high specific gravity appear to be less toxic than mixtures of petroleum of lower specific gravity. Before this relationship can be accepted as established it will be necessary to make a more extended study of the subject.

Public Roads [January and February 1937], (*U. S. Dept. Agr., Public Roads, 17 (1937), Nos. 11, pp. [2]+249–280+[2], figs. 19; 12, pp. [2]+281–303+[1], figs. 27*).—These numbers of this periodical contain data on the status of various highway projects as of December 31, 1936, and January 31, 1937. No. 11 also contains an article entitled Experimental Bituminous Treatment of Sandy-Soil Roads, by P. F. Critz and H. L. Sligh (pp. 249–278), and No. 12 an article entitled Weed Control and Eradication on Roadsides, by O. K. Normann (pp. 281–300).

Alcohol and alcohol-gasoline blends as fuels for automobile engines.—VI, Studies on the use of alcohol-gasoline mixtures as fuels for a high compression eight-cylinder automobile engine, A. L. TEODORO and E. K. ONGSANSOY (*Philippine Agr., 25 (1936), No. 6, pp. 479–492, figs. 11*).—This is the sixth contribution on the subject from the University of the Philippines (E. S. R., 75, p. 405).

Studies were made to compare the performance curves of gasoline with those of alcohol-gasoline mixtures as fuels in an eight-cylinder automobile engine using high-compression heads. Two sets of cylinder heads were used, one set giving a compression ratio of 6.3 and the other a compression ratio of 7.5.

Using ordinary gasoline this engine when tested on the bench at a compression ratio of 7.5 could not develop more than one-half of the maximum power that could be developed at a compression ratio of 6.3. With four passengers as a carload and at a speed of from 20 to 35 miles per hour, higher mileage could be obtained with the use of high-compression heads than with low-compression heads. Detonation was very much in evidence when accelerating, when rounding curves, and when climbing hills. Unsteadiness in operation and loss of power were observed at speeds greater than 35 miles per hour.

When using a mixture of 90 percent gasoline and 10 percent dehydrated alcohol, detonation was so heavy at full load that it was not possible to obtain constant operation for over 10 sec. at any of the desired speeds. At three-fourths load using this mixture and at full load using a mixture of 80 percent gasoline and 20 percent dehydrated alcohol detonation was evident, though the engine could maintain constant load at the desired speed for about 30 min. No detonation was heard in any other tests.

The specific fuel consumption and the mileage obtained with mixtures containing from 40 to 60 percent alcohol when using high-compression heads were nearly the same as those obtained with gasoline when using lower-compression heads. The mileage obtained with the mixtures containing from 10 to 40 percent alcohol was greater than those with gasoline. The mileage gradually decreased as the percentage of alcohol increased from 10 to 40 percent. The

decrease in mileage was from about 1.8 to 4.5 percent per every 10 percent of alcohol added in the mixture with fuels containing from 40 to 95 percent alcohol.

The maximum power developed at the highest speed on full load with high-compression ratio when using the mixtures was more than 10 percent greater than the maximum power that could be developed at the same load with gasoline when using a compression of 6.3.

Tractor engine lubrication under low temperature conditions, E. A. Hardy (*Agr. Engin., 17 (1936), No. 11, pp. 465, 466, 470, fig. 1*).—The results of experiments and observations of tractor engine lubrication under the low temperature conditions prevailing in western Canada during the winter are briefly presented as a contribution from the University of Saskatchewan.

It has been found that the tractor engine must be given special consideration if adequate lubrication is to be had. The engine must be warmed up quickly and maintained at a reasonably high operating temperature. The oil must be clean and of a grade which will flow freely in forming a mist to lubricate the working parts of the engine. The use of top lubrication or oil in the gasoline to protect the piston rings and cylinders during the warming-up period is imperative. Finally the engine must be in good mechanical condition and protected from the extreme cold when operated in zero or subzero weather.

Nebraska tractor tests, 1920–1936 (*Nebraska Sta. Bul. 304 (1937), pp. 38, fig. 1*).—This summarizes the results of 87 tractor tests and includes data on all tractors reported on the market on January 1, 1937 (E. S. R., 74, p. 706).

Farm electrification statistics, September 30, 1936 (*C. R. E. A. News Letter [Chicago], No. 14, (1936), pp. 2, 3*).—Tabular data are presented showing, among other things, the farms in the United States having electric service on December 31, 1935, and on September 30, 1936.

New developments in fertilizer placement research, G. A. Cumings (*Agr. Engin., 17 (1936), No. 11, pp. 461–464, figs. 2*).—In this brief contribution from the U. S. D. A. Bureau of Agricultural Engineering, the progress results are briefly summarized of the fertilizer placement phase of the work of the National Joint Committee on Fertilizer Application.

The results of the 1935 experiments in general indicate that fertilizer is of the greatest benefit to the crop when applied in a band at each side of the row. A placement approximately 2 in. to the side of the seed or plant and about 3 in. below the surface of the ground was the superior treatment in most cases. The most effective location of the fertilizer band at the side of the row differed somewhat with the crop, soil, and weather conditions, and the amount of fertilizer. Fertilizer placed directly under the seed or plant, either in a band or mixed with the soil, in most cases caused early injurious effects which were reflected in the yields. Fertilizer applied broadcast in a limited number of experiments was in all instances decidedly inferior to comparable placements at the side of the row.

The results of experiments with narrow row crops are also presented, and information is given on the development of equipment for advantageous placement of fertilizer.

Harvesting with combines, W. M. Hurst and W. R. Humphries (*U. S. Dept. Agr., Farmers' Bul. 1761 (1936), pp. [2]+37, figs. 13*).—Practical information is given on the development of the combine, the function of its various parts, its attachments, operation, and care. Information also is given on crop characteristics as they relate to combining problems.

New developments in sugar beet machinery, E. M. Mervine and S. W. McBirney (*Agr. Engin., 17 (1936), No. 11, pp. 467–470, figs. 5*).—Recent developments in sugar beet machinery resulting from cooperative studies conducted by

the U. S. D. A. Bureau of Agricultural Engineering and the State agricultural experiment stations in the sugar beet growing States are briefly summarized.

A new buhr type feed mill, F. W. Duffee (*C. R. E. A. News Letter [Chicago], No. 14 (1936), pp. 24–26, fig. 1*).—In a brief contribution from the Wisconsin Experiment Station a 6-in. buhr mill with the main part of the mill a one-piece casting, giving rigidity and simple construction, is described as developed at the station. Service tests have indicated that a half-hour's grinding a day with a 2-hp. motor will take care of the grinding for 20 cows. The mill grinds slowly but very cheaply, and can be operated with a motor varying in size from 0.75 to 3 hp. Tabular data on its operation are briefly presented.

Energy consumption of large churns, J. B. Rodgers (*Agr. Engin., 17 (1936), No. 12, pp. 516, 517, fig. 1*).—Data on the electric power requirements of creamery equipment are reported by the Idaho Experiment Station.

Orchard blowers for frost protection, B. D. Moses (*C. R. E. A. News Letter [Chicago], No. 14 (1936), pp. 9, 10, fig. 1*).—The results of service experiments on the use of blowers for the protection of orchards against frost are briefly reported in a contribution from the California Experiment Station.

Corn drying investigations of the Oregon Experiment Station, F. E. Price and I. Branton (*C. R. E. A. News Letter [Chicago], No. 14 (1936), pp. 7–9, figs. 4*).—Experiments briefly described on the dehydration of ear corn proved that the problem is a simple one of forcing heated air through kilns of ear corn of a depth of from 2 to 3 ft. For drying corn to be used for feeding it was found that the maximum temperature of the air from the furnace may be 175° F.

Satisfactory drying of ear corn was accomplished by using from 75 to 100 cu. ft. of air per minute per square foot of kiln area. It was found possible to recirculate from 50 to 75 percent of the air in the drying system, saving from 45 to 60 percent of the fuel required with no decrease in the speed of drying.

The drier developed for the experiments was a vertical column, continuous process drier. Heated air was forced through two moving vertical columns of corn from a duct between the two columns. The drier was so designed that the thickness of the corn column through which the heated air was passed could be changed to determine the column thickness that would give best results.

Increasing the drier temperature increased the output of the drier per unit area of column space. For that reason it is desirable to operate at as high a temperature as possible without injury to the corn. Shelled corn was dried in less than 1 hr. in the continuous process drier at 175°. In drying corn at temperatures of from 120° to 180° it is advisable to recirculate a considerable portion of the air in the drying system.

The Wisconsin seed corn drier, F. W. Duffee (*C. R. E. A. News Letter [Chicago], No. 14 (1936), pp. 5–7, figs. 2*).—In a brief contribution from the Wisconsin Experiment Station the bin method of drying seed corn developed by the station is described and illustrated, it being pointed out that this method is practical only for use by those who make a business of producing seed corn.

The equipment necessary is a furnace, a multivane blower, a series of bins, necessary power, and a suitable building. The furnace heats the air to around 100° F. The fan blows the air through the bins filled with corn.

The most satisfactory arrangement of bins has been found to be two rows of bins with an alley 3 ft. wide between them. This alley receives the heated air from the fan and connects with the top and bottom of each bin. In this way the heated air can be conveyed to any bin as desired, and by means of dampers the direction of the air in any bin can be controlled.

Seventy-five percent of the air which passes through the corn is brought back to the fan or furnace for recirculating. This cuts the fuel bill up to 50 percent. The heated air is forced through the corn at a rate that does not allow it to make full use of its drying capacity.

A false slatted bottom made out of 1- by 4-in. lumber placed edgewise and about 1 in. apart is placed in each bin about 1 ft. above the floor. This supports the corn and permits the air to flow underneath. Each bin has two dampers, one at the top and one at the bottom, connecting with the alley, and these are open when corn is being dried. On the outside is a door used for loading and unloading the corn.

Chili pepper dehydrator, L. E. HOLMES (*C. R. E. A. News Letter* [*Chicago*], *No. 14* (*1936*), *pp. 20–22, figs. 6*).—This equipment as developed in southern California is described and illustrated, with some results of service tests.

Electric pig brooders, J. R. TAVERNETTI (*C. R. E. A. News Letter* [*Chicago*], *No. 14* (*1936*), *pp. 10, 11, figs. 4*).—In a brief contribution from the California Experiment Station experiments with electric pig brooders are reported.

Two of the brooders were of the radiant or light type, and two were of the underheat type. The light types consisted of 150-w bulbs in 12-in. white enameled reflectors placed over a hole in the top of a triangular-shaped hover 12 in. high and 3.5 ft. on the sides. The underheat type consisted of the same size and shape of hover containing an enclosed galvanized iron box 2 ft. square and 2 in. deep, in which were mounted open heating coils having a connected load of 100 w. The brooders were placed in a corner of the regular farrowing pens from which the guard rails had been removed. A total of 10 sows farrowed in the pens containing the brooders—5 in the two with the light type and 5 in the two with the underheat type.

No difference was observed with the two different types of brooders, but 88.6 percent of pigs farrowed in 1936 were raised to 10 days of age with brooders while only 81.7 percent were raised without brooders.

Air conditioned poultry brooder houses, J. E. NICHOLAS and E. W. CALLENBACH (*Agr. Engin., 17* (*1936*), *No. 12, pp. 518–521, figs. 6*).—Studies conducted at the Pennsylvania Experiment Station are reported which showed that insulation plays an integral part in maintaining desired temperatures and humidities. Four standard 12- by 16-ft. Penn State brooder houses were used, referred to as houses 19, 20, 21, and 22. Curtain and window openings were eliminated. Double doors were used, outside doors being the original standard 3- by 6.5-ft. batten doors. The 6-in. ceiling spaces and the 4-in. wall spaces in houses 19 and 20 were filled with insulating material (mineral wool for house 19 and processed vermiculite for house 20), held in place by ⅜-in. wallboard. The inside doors were constructed with 4 in. of the respective insulation held in place by the wallboard. In houses 21 and 22, the walls, ceilings, and inside doors were lined with two thicknesses of 1-in. Celotex. The floors in all houses were covered with 2 in. of planer shavings.

Two of the brooder houses were operated as "hot" pens, the other two being "cold." In the former, the temperature to be maintained was 75° F., taken 2 in. above the floor at a point 28 in. from the edge of the brooder. The allowed temperature variation was to be approximately ±2.5°. The two cold houses were to be maintained as near to 35° as the existing outside weather conditions would allow.

All equipment was operated electrically. The houses were provided with sufficient insulation and heat to permit six air changes per hour and maintain a 75° temperature differential in zero weather. Two electric heaters equipped with fans, having a heating capacity of 1,320 w each, were used in the hot

houses. One heater was placed in each cold house and set to operate when the house temperature dropped below 35°.

In the two experimental series, 125 sexed chicks were used in each house. The houses and equipment as described were used for the first series from November 27, 1935, to February 20, 1936, houses 19 and 22 being hot and 20 and 21 cold. In the second series from February 26 to May 20, 1936, houses 19 and 20 were hot, while 21 and 22 were cold.

It was impossible to hold the brooder houses at a temperature of 35° without refrigeration, even in winter brooding. There was a wide difference in relative humidity between the cold and hot houses when moisture was not supplied in the latter in the first series. The difference in relative humidities in the cold houses 19 and 20 without additional moisture was but 1 percent. In the hot houses 21 and 22, with additional moisture in the second series, the difference was 5 percent. This is probably due in part to the variation in the number of air changes in the respective houses.

Farm and community refrigeration, E. L. Carpenter and M. Tucker (*Tenn. Engin. Expt. Sta. Bul. 12 (1936), pp. 63, figs. 20*).—This bulletin discusses in popular language the value, uses, designs, costs, and economical operation of refrigeration and refrigeration equipment for farms and rural communities.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the California Station, 1934–36] (*California Sta. [Bien.] Rpt. 1935–36, pp. 137–151*).—Results of investigations not previously noted are reported for studies of the Gravenstein apple situation and the cost of producing honey.

[Investigations in agricultural economics and farm management by the Cornell Station, 1935–36] (*[New York] Cornell Sta. Rpt. 1936, pp. 63–68*).—Brief reports of results found in studies not previously noted are reported as follows: Costs and returns on 93 New York farms, 1934, and prices and yields of apple varieties, both by P. S. Williamson; 1935–36 farm management studies on 100 vineyard farms each in Schuyler and Yates Counties, by E. G. Misner; factors affecting United States imports of butter, variability in retail, wholesale, and farm prices of milk, retail and wholesale prices of butter and evaporated milk, farm prices of butterfat, etc., in the periods 1922–29 and 1930–35, and the spread between farm and retail prices of milk, 1922–35, all by L. Spencer; costs and methods of operation of commercial trucks in transporting fruits and vegetables to market in nine States, by M. P. Rasmussen, N. Fogelberg, and H. W. Mumford, Jr. (U. S. Farm Credit Administration); the public markets situation in south-central New York, by A. T. M. Lee and Rasmussen; land utilization and classification in six counties, by T. E. La Mont; costs of store credit, by O. H. Maughan; and sources and costs of farm credit, by G. W. Hedlund.

[Investigations in agricultural economics by the University College of Wales] (In *Survey of the work of the agricultural departments, University College of Wales, Aberystwyth. [Aberystwyth]: Univ. Col. Wales, 1936, pp. 61–77*).—The work in agricultural economics at the college is briefly described, and some results are given of investigations of agricultural progress in Wales, population, sources of labor and use of supplies, costs of production of milk, farm earnings, and incomes of farm families.

Graphic summary of the agricultural situation, with some related general economic factors (*Tennessee Sta., Agr. Econ. and Rural Social. Dept. Rpt. 21 (1936), pp. IV+36, figs. 33*).—In part 1, The Agricultural Depression, graphs

present data as to the national and agricultural income, per capita production of major industries, prices received and paid by farmers, farm mortgage indebtedness and interest, farm prices and freight rates in the United States, foreign production of agricultural products and other industries, demands for feeds for work stock, etc. Part 2 discusses Some General Economic Factors Affecting the Agricultural Situation.

Agricultural outlook for Illinois, 1937 (*Illinois Sta. Circ. 464 (1936), pp. 32, figs. 13*).—"The Illinois agricultural outlook for 1937 is intended to supply information which will enable farmers to plan more intelligently their farming and marketing operations for the coming year. The information given is based on present available knowledge concerning State, national, and world-wide agricultural and economic conditions—the present and probable future supplies of farm products and the present and probable demand for these products and of the commodities farm people buy."

Drainage and irrigation, soil, economic, and social conditions, Delta area, Utah.—Div. 3, Economic conditions, W. P. THOMAS and G. T. BLANCH (*Utah Sta. Bul. 273 (1936), pp. 50, figs. 7*).—This bulletin, the third of the series previously noted (E. S. R., 73, p. 586), deals with the economic conditions of the area. It analyzes and discusses the ability of the farmers to pay taxes, farm indebtedness, and farm expenses, and makes recommendations for farm business reorganizations. Analysis is made of the farm business in the area, using 85 farm reports for the 1929 crop year, 92 for 1930, and 111 for 1931.

During the 3 yr. studied the average farm investment of the farms surveyed was $7,804, indebtedness $3,357, yearly receipts $1,461, cash operating expenses $1,304 exclusive of $166 for livestock purchases, and labor income—$709.

The major steps recommended in reorganization of the agriculture of the area are "(1) taking from cultivation all large areas of land that normally do not produce sufficiently to pay the costs of cultivation; (2) transfer of irrigation water from the less productive soils to the better soils of the area; (3) establishment of larger farm units; (4) livestock production as the major enterprise of the area; [and] (5) capacity of the land to produce should be the basis for the reorganization program for the area."

A socio-economic atlas of Oklahoma, M. F. BURRILL (*Oklahoma Sta. Misc. Paper, 1936, pp. VI+124, figs. 168*).—Included are maps and charts showing county boundaries, cities, post offices, physiographic regions, soil types, climatological data, number of farms, use of land, crop data, values of farm land, buildings, and machinery, numbers or amounts of livestock and livestock products, tenure of farm lands, type of farming area, mineral resources, public utilities, transportation facilities, distribution of industrial plants, population, illiteracy, banking, county bonded indebtedness, and other similar data.

Farm tenure in Iowa.—I, Tenancy problems and their relation to agricultural conservation, R. SCHICKELE and C. A. NORMAN (*Iowa Sta. Bul. 354 (1937), pp. 161–184, figs. 12*).—This bulletin summarizes the discussion with 28 County Agricultural Conservation Committees of the amounts and causes of mobility of tenants, instability of ownership and insecurity of tenants, types of leases, and the provisions as to length, compensation for unexhausted improvements, minor repairs, rent adjustments, landlord's lien, use of land, etc., and improvements in the leasing practices. The study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, the Agricultural Adjustment Administration, and the Resettlement Administration.

Migratory labor in California (*San Francisco: State Relief Admin. Calif., 1936, pp. [9]+224, [pls. 8, figs. 10]*).—This study, prepared under the direction

of A. Holzschuh, includes a history of migratory labor in California, by F. Safier; the findings in a study of 775 agricultural workers on relief in California, by G. E. Kimble and R. Wilson; and case studies of four migrating families, by E. Edwards, H. White, and W. J. Plunkert.

Drought refugee and labor migration to California (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 42 (1936), No. 2, pp. 312-318; 43 (1936), No. 6, pp. 1355-1363*).—In No. 2, by P. S. Taylor and T. Vasey, tables show by months, June 16–December 15, 1935, and by State of origin the numbers of migrants "in need of manual employment" entering California, the number entering California in automobiles, the major race groups entering from selected States, and the number of Mexican migrants. Of the 53,374 migrants, 89.5 percent were white and 6.3 Mexican and 19.1 percent were returning Californians.

No. 6, by E. J. Rowell, covers the year ended June 15, 1936.

References on the Great Lakes-Saint Lawrence waterway project, E. E. Edwards and E. J. Lowe (*U. S. Dept. Agr., Library, Bibliog. Contrib. 30 (1936), pp. [5]+185*).—This mimeographed annotated bibliography includes 5 references to bibliographies, 10 general background references, 43 references to the documents of Canada and its provinces and the United States and States, 650 references to books, pamphlets, and articles, and 211 references on the Georgian Bay, Sault Ste. Marie, and Welland Canals and lake level problems.

Characteristics and costs of county government in Arkansas, C. O. Brannen (*Arkansas Sta. Bul. 338 (1937), pp. 91, figs. 3*).—"The chief purpose of this study has been to determine the costs and bases of support of county government in relation to operating divisions and their functions, and to indicate, wherever possible, changes that might be made either for reduction in cost or improvement in services. The methods used have included the collection of information from official sources on revenues, operations, and expenditures, and the arrangement of such information to reveal, primarily, essential facts pertaining to administrative costs." The period used is the budget years of 1931 and 1932.

The duties of administrative offices and the fee system of payment of officers are described. Analysis is made of the budgets and costs, and the variations between counties and the possibilities of reducing costs are discussed.

The total average (1931 and 1932) cost of county government was $7,667,036, of which 30.6 percent ($1.27 per capita) was expended for constitutional offices, 30.7 percent for general county expenses, including bonds, and 38.7 percent for county roads. Of the general costs, 33 ct. per capita went for court costs other than administrative office fees, 21 ct. for pauper and other charity, 21 ct. for county bonds, 4 ct. for agricultural and home economics extension work, 3 ct. for health service, and 45 ct. was unspecified.

"It is evident that many of the costs of county government are too high in terms of the actual services performed, mainly because of the arbitrary number of officers provided in the constitution, the fee method of compensation prescribed by the general assembly, and the lack of privilege on the part of the county to manage either expenditures or personnel. . . . If worth-while county governmental reform is ever to be realized, it will be necessary to amend the constitution. The least that a constitutional amendment, for this purpose, should provide at the option of the county are the following: (1) Consolidation of county offices and rearrangement of the duties between officers, (2) management of the fiscal and personnel affairs of the county, (3) substitution of appointive for certain elective officers, particularly the tax assessor, and (4) an elective board of managers, not to exceed 15 members per county,

to take the place of the present quorum court, to have official charge of all county business, including administrative offices, special services, and the county road system."

Reorganization of local government in New York State (*N. Y. State Comn. Rev. Tax Laws Rpt., 6 (1935), pp. 695, pl. 1, figs. 35*).—This sixth report of the New York State Commission for the Revision of the Tax Laws includes chapters on reorganization and the transfer of functions, the present legal framework of local government, highway construction and maintenance, public health and welfare, the control of crime, county clerk and the register, the assessment of property and collection of taxes, the cost of local government in New York, local controls over expenditures, State aid in New York, the personnel problem in New York State's local governments, municipal credit in New York State, the fee system of compensation, the village as a special problem, the attitude of county officials toward the reorganization of local government, efficiency and economy through the establishment of cooperative services, and new problems of local government, and the conclusions reached by the commission and its recommendations to the legislature.

Some economic problems of cotton gins in Oklahoma, R. A. Ballinger and R. C. Soxman (*Oklahoma Sta. Bul. 231 (1936), pp. 76, figs. 5*).—"The purpose of this study is to examine thoroughly the operation of cotton gins as a public service business under the supervision of the State Corporation Commission of Oklahoma. The available records of the commission, particularly with respect to the number, size, and location of gins, the volume of ginnings, the operating revenues, expenses, and profits of the industry in relation to the variable factors peculiar to the business have been analyzed in order to show the importance, or lack of importance, of various factors in determining the financial success of cotton gins." The legal regulations regarding gins, the establishment of ginning rates by the Corporation Commission of Oklahoma, the importance of snapping cotton and its influence on the financial structure of gins, and the cotton buying activities of ginners are also discussed.

The number of gins decreased with some fluctuations from 568 in 1926–27 to 380 in 1932–33 in the eastern part of the State and increased from 331 to 391 in the western part of the State. During the period from 1929–30 to 1932–33 the average book value per gin was $15,112 in the eastern part and $23,707 in the western part of the State. The average number of bales received per gin was 880 and 1,472, and the average number of saws per plant 314 and 375, respectively, in the two areas. Of the gins, 52.2 percent in the eastern part of the State and 51.3 percent in the western part were owned by corporations. Of all plants, 16.6 percent were operated by partnerships, 16.5 by individuals, and 11.6 percent by cooperative associations, 95.7 percent of the cooperative associations being in the western part of the State.

Operating revenues per plant in the western part of the State were more than double those in the eastern part, but the net income per plant was several times larger in the western part. Reduction of ginning rates during the 4-yr. period reduced revenues per bale 29.6 percent in the eastern part and 22.2 percent in the western part of the State, but the decreases were more than offset by decreased expenses per bale of 37.1 and 28.4 percent, respectively, in the two areas. Since 1930–31 the net income per bale has decreased in the eastern part and increased in the western part of the State. The expense of ginning declined rather consistently as the number of bales ginned increased. From 1929–30 to 1932–33, 719 gins (22.1 percent of the total number), of which 78.7 percent were in the eastern part of the State, were operated at a loss. The gins showing a loss ginned on an average 490 bales as compared with 1,361

bales in the plants showing a profit. When analyzed on the basis of number of bales to gin there was little if any significant difference in the profits per bale in gins under different types of ownership nor in the relation of number of days gins were operated to expenses and income per bale.

Snapped cotton made up 52.5 percent of the cotton ginned during the 4 yr., 94.5 percent of the gins receiving 20 percent or less of their unginned cotton as snapped cotton being in the eastern part of the State. The larger proportion of snapped cotton increased the profits per bale in the western gins. Of the total ginnings, 63.5 percent were purchased by the ginners, of which amount 31.5 percent was purchased in seed (principally in the eastern part of the State), and 68.5 percent as lint.

Rates for ginning and wrapping American cotton, and related data, seasons 1928–29 to 1935–36, J. W. Wright and W. B. Lanham (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. 35, figs. 4*).—Tables and charts are included and discussed showing among other data the capacity of gins, volume of ginnings, systems of assessing charges used, and estimated average charges under each system. A table of rate converion formulas is given.

Average charges for ginning and wrapping upland cotton declined from $5.96 per 500-lb. bale in 1928–29 to $4.12 in 1931–32, then rose to $5.04 in 1934–35 and 1935–36. The charges for American-Egyptian cotton decreased from $17.21 in 1928–29 and 1929–30 to $11.06 in 1931–32, then increased to $12.72 in 1935–36. The quantity of seed cotton required for a standard bale in the different sections of the Cotton Belt varied considerably. The averages in 1934–35 were hand-picked cotton 1,423 lb., snapped cotton 1,972, bollies 2,242, and sledded cotton 2,589 lb. Of the cotton gins, approximately one-half were owned by individuals and one-fourth each by partnerships and corporations.

The distribution of American raw cotton, season 1932–33, J. W. Wright and J. H. McLure (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. 121, figs. 34*).—Tables, charts, and maps are included and discussed showing the primary distribution from producing regions, the world distribution of American raw cotton, supply areas of domestic consuming centers, areas of supply and distribution for ports and interior markets, modes of transportation, types of bales, and seasonal movements of cotton.

Approximately 42 percent of the cotton in 1932–33 went to domestic consuming centers, the remainder being exported. Of the domestic distribution, approximately 83 percent went to mill centers in cotton-producing States. The exports were principally to Germany, Japan, Great Britain, France, and Italy. Of the domestic distribution, about 72 percent was shipped by rail, 21 percent by trucks, and 7 percent by water or combined rail and water. Of the cotton received at southern ports, 72 percent was transported by rail, 22 percent by trucks, and 6 percent by inland waterways. Of such cotton, approximately 38 percent was shipped in uncompressed square bales, 58 percent in compressed square bales, and 4 percent in round bales. Seventy percent of the cotton was shipped during the months from September to January, inclusive.

Trends in the Canadian tobacco industry, 1920–1934, T. G. Major (*Canada Dept. Agr. Pub. 487 (1936), pp. 32*).—The areas in production, development of the leaf production industry, prices, costs of production, the domestic market, and export trade are discussed. The conditions in other producing countries are also described briefly.

World wheat survey and outlook [January, May, and September, 1936], M. K. Bennett, H. C. Farnsworth, and H. Working (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 12 (1936), Nos. 5, pp. [2]+183–220, figs. 8; 9, pp. [2]+313–338, figs. 5; 13 (1936), No. 1, pp. [2]+31, figs. 7*).—Data as for these three dates are reported in the respective numbers.

World wheat utilization since 1885–86, M. K. BENNETT (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 12 (1936), No. 10, pp. [2]+339–404, figs. 13*).—This study represents a pioneer attempt to survey developments in the utilization of wheat, as distinguished from production or supplies of wheat, in a specially defined "world" during the past 50 yr. The course of world wheat utilization reflects broadly measurable changes in population and in per capita utilization. For each of 15 post-war years it is possible to estimate roughly, for most of the 40 countries included, total and per capita amounts of wheat used annually for food, feed, and seed. The prospects for expansion of world food consumption of wheat are more limited than they have been considered heretofore.

Variability of cropping systems and yields within the eastern meat producing area of Iowa, W. W. WILCOX and N. V. STRAND (*Ames: Iowa State Planning Bd., 1936, pp. [2]+30, figs. 9*).—Eight townships each were selected on a basis of soil surveys as representative of the most, intermediate, and least productive soils. Tables show for each group the percentages of soils in each soil productivity class; size of farms; tenure in each size group; percentage of land in corn, hay, and small grains; and farms having specific yields of corn and oats on owned and rented farms in each size group.

Soil abuse in the area is due more to failure to grow sufficient soil-conserving crops than to overcropping to corn. Nearly 50 percent of the farmers on the more productive soils are failing to meet recommendations as minimum acreages of soil-conserving crops. Tenants till a larger proportion of their farms than owners. Tenants' systems of farming tended to be more exploitive on the least productive lands, and they offend to a greater degree in not growing sufficient soil-conserving crops. Average yields of corn and oats on owner farms were slightly higher than on tenant farms. There was no significant difference as between soil groups. The percentage of farms of less than 140 acres was highest on the least productive soils, and a higher proportion of small farms was operated by owners.

A farm management study of small farms in two areas of Puerto Rico.—I, Carolina-Trujillo Alto; II, Isabela, J. E. MCCORD, S. L. DESCARTES, and R. HUYKE (*Puerto Rico Col. Sta. Bul. 43 (1936), pp. 64, figs. 5*).—This bulletin presents the results of a study of records obtained by personal visits to 138 farms in the Carolina-Trujillo Alto area and 99 farms in the Isabela area. Analysis is made of the farm organization and factors affecting labor income in each area.

The factors having the greatest apparent effect on labor income were gross receipts, total and per cuerda (0.97 acre), cash labor costs per cuerda in crops, percentage of total value of products sold, and crop index.

"On the individual farms, as the number of the more important of these factors increased above average the higher were the labor incomes. Those farmers who had the best organized business enterprises had returns for their own labor from 3 to 10 times greater than the average. Basically, the standard of living on small farms depends upon the amount of good land, cash crops of high value per acre, yields higher than the average of the community, and full utilization of land and labor to provide cash income and family living from the farm."

An economic survey of the commercial broiler industry, W. D. TERMOHLEN, J. W. KINGHORNE, E. L. WARREN, and J. H. RADABAUGH (*U. S. Dept. Agr., Agr. Adjust. Admin., 1936, pp. V+54, figs. 9*).—Included is factual information regarding the physical set-up of the industry, production, marketing, and costs of production. An intensive study was made of the industry in the Delaware-Maryland-Virginia Peninsula (approximately 66 percent of the commercial

production of the United States is in this area), through questionnaires, county meetings, and personal contacts. Data of the Maryland Experiment Station on costs of production previously noted (E. S. R., 75, p. 412) were used. The industry in the United States and in the area studied is described. The data are analyzed and discussed under the headings of broiler chicks, credit, production costs, local marketing, terminal marketing, prices, and consumption.

[**Truck crop growing, grading, and packing in Hawaii**], H. H. WARNER, R. H. GAST, and H. B. CADY (*Hawaii Sta. Rpt. 1936, pp. 66–68*).—The comparative prices of graded and standard packed and ungraded tomatoes are given, and a table showing the areas in truck crops and fruits and nuts and number of growers as of June 1936 is included.

Soybean costs and production practices, R. C. ROSS (*Illinois Sta. Bul. 428 (1936), pp. 341–388, figs. 4*).—This bulletin is based on detailed cost records covering the period 1928–34 on farms in Champaign and Piatt Counties and enterprise cost records in 1928 and 1929 from 226 farms in 10 central counties and 2 other counties. Analysis is made of the relations to yield of amounts of labor and power, cultivation, width and time of planting, and variety; inoculation and seed costs; costs of production and of harvesting by different methods; time of and losses in harvesting; value of straw; and methods of disposing of beans to costs of production. The income and profit from soybeans and their place on central Illinois farms are discussed.

Total acre costs of production in 1934 were $17.95 for beans harvested with binder and thresher, $14.89 with combine, and $16.36 for hay. Preharvest costs declined markedly from 1928 to 1934 due largely to reductions in the price of seed and rates for labor and power. Harvesting with combines required less than one-third as much man labor and less than one-sixth as much horse work as with binder and thresher. Grain yields increased about 0.94 bu. per acre with each additional input of man labor up to from 5 to 5.5 hr. per acre. Losses of beans were much greater with binders and threshers than with combines. Man labor per acre for ground preparation, seeding, and cultivation varied from 1.5 to 10 hr. Horse labor increased with man labor, but tractor use was relatively constant. Hay yields were affected but little by amount of labor input before harvest. Row planting showed no particular advantage in yield over drilling solid. The soybean acreage on the farms studied increased from 16.5 percent of the farm area in 1928 and 1929 to 36 percent in 1935, and in the latter year exceeded the acreage in corn. The crop was generally profitable in 1928–30 and in 1934. From 1930 to 1934 soybeans were more profitable than corn, but the price relationships were abnormal.

Financial management of farmers' creameries as affected by volume and prices, A. MIGHELL and P. E. QUINTUS (*Iowa Sta. Bul. 351 (1936), pp. 40, figs. 8*).—This bulletin is based on a series of annual reports for 19 cooperative creameries in Iowa using a uniform system of supervised creamery accounting, 1929–34, and the comparable records of 66 cooperative creameries in 1933. "The study includes a brief description of the creamery business as reflected in the financial statements, with special reference to the effect of volume on creamery operating costs and margins. It should be of interest to managers, boards of directors, and farmer patrons." In the analysis the creameries were divided into four groups on the basis of volume of butterfat handled.

The operating expenses in 1933 for the 66 creameries averaged 3.8 ct. per pound of butterfat in those handling less than 250,000 lb. of butterfat, 3.24 ct. for those handling from 250,000 to 450,000 lb., 2.67 ct. for those handling from 450,000 to 650,000 lb., and 2.37 ct. for those handling over 650,000 lb. The cost ranges were 4.95–2.72 ct., 4.5–2.3 ct., 3.46–2.07 ct., and 3.44–1.72 ct., respectively, and the margins retained by the creameries averaged 3.71 ct., 3.31 ct., 2.89

ct., and 2.57 ct., respectively. The average financial ratios for the 66 creameries as of December 31, 1933, were: Current assets to current liabilities 1.34:1, net worth to total liabilities 2.22:1, net worth to fixed assets 1.15:1, net worth to capital stock 1.94:1, and pounds of butterfat per $1 fixed assets 37.1. The creameries handling over 650,000 lb. of butterfat had higher average ratios in all cases and the group handling from 450,000 to 650,000 lb. in all but the net worth to capital stock ratio.

The net incomes of 17 creameries studied in 1933 were from 0.1 to 0.92 ct. per pound of butterfat less than the cost in the 5 mo. from January to March and November and December. In the other 7 mo. it was from 0.09 to 0.83 ct. per pound higher.

The total volume of butterfat handled by 19 creameries increased from approximately 365,933 lb. in 1929 to 561,498 lb. in 1934, the annual increases ranging from approximately 43,600 to 50,500 lb. The average operating expenses per pound of butterfat decreased from 3.72 to 2.66 ct. in 1933 and then increased to 2.81 ct. in 1934. The margins retained by the creameries decreased from 3.84 to 2.84 ct. in 1933 and then increased to 2.93 ct. in 1934.

Livestock marketing methods in Denmark, Great Britain, and Canada, G. SHEPHERD (*Iowa Sta. Bul. 353 (1937), pp. 113–160, figs. 9*).—The recent developments in livestock marketing practices and how farmers are meeting their marketing problems in the three countries are discussed.

The marketing of Australian and New Zealand primary products, W. M. SMITH (*London: Isaac Pitman & Sons, 1936, pp. XVII+352, figs. 3*).—The operation of the existing mechanism by which commodity exchanges are effected between Australia and New Zealand and the United Kingdom and the equity of the adjustments that have been made under existing trade agreements are discussed in chapters on the impulse to large scale marketing, legal aspects of marketing organization, marketing control organizations, the structure of the markets, the problem of maximizing returns to producers, and the marketing prospect.

Crops and Markets, [December 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), No. 12, pp. 405–472, figs. 3*).—Included in addition to the usual livestock estimates, market reports, and data as to the price situation and price movements of important agricultural products are the final crop reports for the year 1936 with comparisons with 1935 and tables showing the estimated gross costs, credits, and net costs per acre and net cost per bushel of producing corn, wheat, and oats in 1935 by groups of States and the estimated gross costs, credits, and net cost per acre and per pound of lint in producing cotton in 1935.

Variations in retail prices of certain branded foods, M. G. REID and E. SCHICKELE (*Jour. Home Econ., 28 (1936), No. 10, pp. 691–695, figs. 2*).—Data were obtained on the prices of 28 branded commodities in 8 stores in Ames, Iowa (a college town of about 10,000 population) on Tuesdays and Saturdays from February 26 to June 18, 1935. The average number of price changes per commodity was 2.4, varying from 1.3 to 4.2 for the different stores and from 1 for cocoa to 5.6 for canned peas. In the 3 stores with the greatest number of price changes, Tuesday prices averaged 0.6 percent higher than Saturday prices for the 28 commodities and 1.2 percent higher for the 16 commodities having the greatest number of changes.

The limited survey showed "(1) in some grocery stores prices are much more stable than in others; (2) price changes are more frequent for some staple commodities than for others; (3) Saturday markdowns are not entirely counterbalanced by markups, but they are offered on so few items at a time that the effect on the general price level is rather negligible; (4) the

great frequency of price change, especially for certain products, makes it very difficult to compare the price levels in competing stores; [and] (5) important savings are possible to one who is willing continually to shop from store to store and to keep a record of regular prices by means of which unusually low prices can be recognized."

Organization and management of consumers' cooperative associations and clubs (with model bylaws) (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 598 (1934), pp. VI+71*).—Information is presented on the methods of organizing and operating consumers' cooperative associations and clubs. Model bylaws for such associations and clubs are included.

Membership relations of cooperative associations, J. W. JONES (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 9 (1936), pp. IV+111*).—The influence of the association structure, attitudes of managers and directors, member's position in the association, means of making contact with the membership, expense of membership service, and house organs and other means of publishing news are described and discussed.

Consumers', credit, and productive cooperation in 1933, F. E. PARKER (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 612 (1935), pp. VI+80*).—The results of a statistical study of the 1933 experience of all types of cooperative associations in the United States (except farmers' marketing associations) are presented under the headings of consumers' organizations, central consumers' organizations, credit and banking societies, and workers' productive associations.

Ohio agricultural statistics, 1935, G. S. RAY, L. H. WILAND, and P. P. WALLRABENSTEIN (*Ohio Sta. Bul. 577 (1936), pp. 88, fig. 1*).—This bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, continues the series previously noted (E. S. R., 74, p. 409). In addition to the preliminary county estimates for crops for 1935 and numbers of livestock on farms January 1, 1936, it includes revised county estimates for 1930–34 for corn, wheat, and oats, for 1929–34 for potatoes and tame hay, and for January 1, 1930–35, for numbers of livestock on farms.

RURAL SOCIOLOGY

First annual report, Resettlement Administration (*Resettlement Admin. [U. S.], Ann. Rpt., 1 (1936), pp. VIII+173, pl. 1, figs. 35*).—This report covers progress in land utilization, rural rehabilitation, rural resettlement, and suburban resettlement.

Planning for city, State, region, and Nation: Proceedings of the Joint Conference on Planning, May 4, 5, and 6, 1936, Richmond, Virginia (*Chicago: Amer. Soc. Planning Off., 1936, pp. VIII+170*).—These proceedings of a meeting of the Joint Conference on Planning of the American City Planning Institute, American Planning and Civic Association, and the American Society of Planning Officials included papers as follows: County Planning in Iowa, by P. H. Elwood (pp. 54–58), Distinctive Features of Planning Procedure in Clackamas County, Oregon, by L. C. Stoll and V. B. Stanbery (pp. 59–65), and County Agricultural Adjustment Planning, by B. W. Allin (pp. 66–71); on intercounty organization—The Georgia Eastern Coast District, by H. T. McIntosh (pp. 72–74), and Tennessee Counties, by G. Gimre (pp. 75–77); and on the progress of State planning in Massachusetts by E. M. Herlihy (pp. 81–87), South Dakota by W. R. Ronald (pp. 87–90), Florida by C. B. Treadway (pp. 91–94), New Jersey by C. P. Messick (pp. 94, 95), and Virginia—State Planning and Education, by S. B. Hall (pp. 96, 97), State Planning and Conserva-

tion and Development, by *W. C. Hall* (pp. 97–101), and *State Planning and Legislative Planning*, by W. R. Shands (pp. 101, 102). Other papers are included on city and national planning.

Report of the Illinois State Planning Commission, December 1934 (*[Springfield]: Ill. State Planning Comn., 1935, rev., pp. [8]+91, [figs. 47]*).—This report presents facts as to the population, natural resources, land utilization, transportation, private industry, and public works of the State; draws conclusions thereon; and makes preliminary recommendations for the State.

***Preliminary report*, State Planning Board of Indiana** (*[Indianapolis]: Ind. State Planning Bd., 1934, vol. 1, 2. ed., pp. [6]+163, [pls. 79]*).—This volume includes data on the living conditions, gainful occupation, land use, and transportation of Indiana, and discusses the public works program recommended and legislation necessary to carry it into effect.

Proceedings of Southeastern Planning Conference, Savannah, Georgia, December 4–5, 1935 (*Albany, Ga.: Natl. Resources Com., Fourth Dist., [1935], pp. [4]+96, [pl. 1]*).—Included are the following papers or summaries of papers presented at a 1935 conference of the Fourth District National Resources Committee (Alabama, Georgia, Florida, and South Carolina): Organization of City and County Planning Boards, by R. H. Randall (pp. 9–14); State Planning, by M. L. Wallerstein (pp. 15–23); State Planning in Florida, by C. B. Treadway (pp. 24–28); A Forestry Program, by J. C. Kircher (pp. 29–37); Citizen Support of Planning, by F. A. Delano (pp. 38, 39); Plan in Our Future, by D. Sholtz (pp. 40, 41); The Gulf-Atlantic Ship Canal and the Southeastern States, by S. L. Lowry, Jr. (pp. 42–52); Cooperation of Federal Agencies Through National Resources Committee, by R. H. Randall (pp. 53, 54); Federal, State, and Local Cooperation in Planning the Works Program in Georgia Under CWA, FERA, and WPA, by G. B. Shepperson (pp. 55–59), with discussion, by P. A. Fellows (pp. 60–73); The Rural Resettlement Program, by P. Weltner (pp. 74, 75), with discussion, by W. A. Hartman (pp. 76–81); Maps and Mapping the Sine Qua Non for Planning, by B. R. Van Leer (pp. 82–91); and Regional Planning, by E. S. Draper (pp. 92–95).

Maine State Planning Board Report, 1934–1935 (*Maine State Planning Bd. Ann. Rpt., 1 (1935), pp. [2]+XIV+396, pls. 2, figs. 243*).—This report covers the year ended March 15, 1935, reviews the planning procedure and research of the board, and describes the board's program for public works. Data are presented as to transportation; land use and agriculture; conservation; recreation; public utilities; sanitation, public health, and welfare; social conditions; industry and commerce; water resources; climatology; public administration, and surveys and maps.

Report of the Virginia State Planning Board, IX. Pt. 17, Mobility and changes of populations in Virginia, 1930 to 1935 (*[Richmond]: Va. State Planning Bd., 1936, vol. 9, pt. 17, pp. III+84, pls. 18*).—Data analyzed in this report include those dealing with natural gains, the school census, the agricultural census, and probable populations and composition changes as in 1935.

The hill country of northern New England: Its social and economic history, 1790–1930, H. F. Wilson (*New York: Columbia Univ. Press, 1936, pp. XV+455, [pls. 4, figs. 13]*).—The readjustments in agriculture in northern New England from 1790 to 1930 and the forces responsible for the readjustments are described.

[Iowa State Planning Board, second report, 1935] (*[Ames]: Iowa State Planning Bd., 1935, pp. XXIV+226, pls. 8, figs. 129*).—This second report (E. S. R., 72, p. 548) is divided into parts as follows: Land, with sections on need for adjustment, recommended physical adjustments, proposed plans for advancing such adjustments, wildlife areas and land use planning, and part-time

farming; water, with sections on investigations, field work, and the lower Des Moines River Valley; people, with sections on population and social trends, public education, Iowa's housing problem, proposed program for recreation, zoning and planning, and historic and scenic sites; and commerce, with sections on planning Iowa's transportation system, public service in the State, surveys of business and industry, and a program for public works construction in the State.

Rural organizations and land utilization on Muscatine Island: A study of social adjustments, R. E. Wakeley and J. E. Losey (*Iowa Sta. Bul. 352 (1936), pp. 41–111, figs. 14*).—Muscatine Island, located south of the city of Muscatine, has an area of 22,000 acres, 17,000 of which are suitable for farming.

While floods, occasional drought, and a sandy soil discouraged corn growing, by 1870 the commercial production of melons and cantaloups was firmly established. Sweetpotatoes soon became one of the most important crops. Production of other vegetable crops, including cabbage, tomatoes, cucumbers, and asparagus, increased during the decade following the Civil War. Canning factories, established in Muscatine, encouraged the growing of these crops, and large acreages were grown on the heavier soil near Muscatine. The isolation of the island from the surrounding farming territory was increased by this change in type of farming.

By 1900 increased production of melons in other parts of the United States and the use of refrigerator cars increased the competition. Marketing problems became acute. Melon wilt became a major factor in island agriculture in 1908, making it impossible to produce a profitable crop of melons oftener than once in 7 yr. Idle land and resulting lack of income remained major problems at the time of this study.

The creation of a drainage district in 1914 made a large part of the swampy land along the slough available for agricultural purposes. This increased the number and importance of the heavy-land farmers who specialized in the production of grain and livestock.

Population data are presented for the 169 families interviewed. Of the total of 727 persons, 595 in 134 families lived on farms.

Approximately one-third of the families on the island are of German descent and the rest of English extraction. The foreign-born were mostly past 45 yr. of age and constituted a very stable element in the population.

Natural families averaged 4.7 persons per family. Farm families averaged 4.8 persons and nonfarm families averaged 4.2 persons per natural family.

Only 23 percent of the farm operators and only 9.2 percent of the wives of operators were born on the island. No farm family had lived on the same farm for more than two generations. The average period of residence on their present farm was 13.1 yr., and on the island 26.1 yr.

Island homes were seriously lacking in modern conveniences and equipment. Less than 1 in 6 had electric lights, 1 house in 30 had piped hot and cold water, and 1 in 20 had a furnace. Island homes excelled in the number of homes with water pumped in the house by hand pumps, usually located in the kitchen.

Expenditures by all island families for health and medical care were small. Twenty families of the 175 living in Fruitland Township received relief, ranging in amount from $2 to $20 per month during the winter of 1933. Only six families in the sand-land area received relief, and only three of these were farm families.

Elementary schools gave all the education obtained by nearly three-fourths of the island population 15 or more years of age. All had attended school but 5 percent had not passed fourth grade. Ten percent had received some educa-

tion above grade school, less than 1 in 25 had attended college, and none had been graduated from college.

"Generally expressed, the interests of island farmers rank as follows: First, church activities; second, social activities; third, home development; fourth, scientific farming; fifth, school activities; sixth, farmer organizations; seventh, politics; eighth, young people's activities. Nearly 50 percent more families expressed church interests than any other. Scientific farming, home development, and school activities were about equally strong."

The Japanese rural community, F. R. Yoder (*Rural Sociol., 1 (1936), No. 4, pp. 420–429*).—The author studied Japanese rural social life for 10 mo. and made brief general surveys of 14 Japanese rural communities.

The convenient rural community unit for study in Japan is the mura, a rather self-sufficient rural unit containing the mura government hall and offices, a 10- to 20-room elementary school, a dozen or more Shinto shrines and Buddhist temples, a post office, small trading shops, buildings and headquarters of farmers' cooperative societies, and various types of fellowship and amusement center facilities and buildings. The very small size of farms makes the mura a compact social unit. The average size of farms for all Japan is only 2.7 acres, with only 1.3 percent over 12 acres. The Japanese peasant families are voluntarily bound together in little groups of five households each for purposes of mutual help and protection.

The land and tenure system of Japanese agriculture affects the structure and the social relationships of the rural community. As late as 1873 most of the agricultural land was held by a relatively small number of landlords, and the great mass of rural dwellers worked as serfs on the land. The government undertook in 1873 to redistribute the land among the workers on the soil, but while land has been made a marketable economic good, it changes hands or families only with the greatest difficulty and thus inflexibility holds the rural community to a rather rigid cultural pattern.

The local agricultural society is a cellular unit of the Imperial Agricultural Society, national in its scope and organization. Practically every rural community also has its cooperative buying, selling, utilizing, and credit societies, of which more than half of the Japanese farmers are members. The local societies are federated into provincial and national associations.

While the Japanese rural people are fairly religious, worship is rather by families and individuals than by groups. Only on certain festival, holiday, and patriotic occasions is there a manifestation of communal worship at the shrines and temples, but these are likely to be large community events for the peasants.

The rural elementary schools are of large size, usually having from 10 to 20 teachers and from 500 to 1,000 pupils. The superintendents of the schools are highly respected by the community and are quite often leaders in its activities and organizations.

The local government of the mura is closely tied in with the agriculture of the community. The mayor is often the president of the local agricultural society or of one or more of the cooperative societies.

The chief changes that have taken place in Japanese agriculture have been in the increase of scientific methods of cultivation, selection and improvement of varieties of plants, yields per acre, and development of agricultural associations and cooperative societies. The social organization of the rural community has changed little in many years. Japan as a nation, therefore, presents a strange contrast of almost medieval rural communities alongside modern machine-made cities.

With rural relief in Colorado, February–November 1935, O. F. LARSON (*Colorado Sta. Res. Bul. 1 (1936), pp. [3]+28, figs. 5*).—This is the first of a series of bulletins planned to present selected phases of the rural relief situation in Colorado as found in representative counties from February to the end of November 1935. It gives the reasons for opening and closing rural relief cases, shows what disposition was made of such cases when the Federal Emergency Relief Administration stopped giving assistance, and describes the type of cases selected by the various agencies to which cases went from the rural relief rolls. The basis for the information presented is data collected by the survey of current changes in the rural relief population, a study made by the social research division of the Works Progress Administration.

Social security and rural relief in Colorado, O. F. LARSON and J. E. WILSON (*Colorado Sta. Res. Bul. 2 (1936), pp. [5]+12+[1], figs. 4*).—This report describes the extent and characteristics of cases which received general assistance from the Emergency Relief Administration between June and the end of November 1935, and which were potentially eligible for such specified aid under the social security program as old age assistance and aid to dependent children. Data are presented as to the extent and characteristics of cases which were unemployable or potentially unemployable. Some of the types of "problem cases" discovered in these rural areas are discussed.

Rural youth and relief in Colorado, O. F. LARSON and J. E. WILSON (*Colorado Sta. Res. Bul. 3 (1936), pp. [4]+16, pl. 1, fig. 1*).—Data are presented which show the number and distribution of rural youth aged 16–25 who were in households receiving general assistance from the Emergency Relief Administration during the period between June 1 and November 30, 1935. A description is given of some of the characteristics of these youth which are considered important from the standpoint of aiding youth adjustments. These characteristics include family status, educational attainments, employment status, and occupational experience. A limited comparison is made of relief and nonrelief youth.

Contemporary background of California farm labor, P. S. TAYLOR and T. VASEY (*Rural Sociol., 1 (1936), No. 4, pp. 401–419, figs. 7*).—As pointed out in a previous article (E. S. R., 76, p. 266), the value of intensive crops represented less than 4 percent of the total value of California agricultural production in 1879, but by 1929 it was practically four-fifths of the total. Demand for farm labor in California is heavy because of this intensive crop production and also concentrated to a marked degree because of the scale of farm operation. More than one-third of all large-scale farms in the entire country were located in California in 1930. The large farm is very prominent in the rural economy, and the large grower exercises great influence in councils of agricultural employers.

The tenuousness of the connection of California farm laborers with the farm is further emphasized by the fact that only 43.5 percent resided on the farm in 1930, as compared with 74.4 percent of paid farm laborers in Mississippi.

California agriculture has thus built up a rural proletariat, partly of alien race, propertyless, without ties to the soil which it tills, and subject to regular unemployment caused by the highly seasonal demand for labor which at its slack in January is only 23.4 percent of the peak demand of September. High mobility has therefore become a necessary characteristic of those who "follow the crops."

Decline of cotton production in Imperial and Riverside Counties was followed almost immediately by tremendous expansion in the San Joaquin Valley of central California with corresponding changes in the need for seasonal labor.

Scores of thousands of men, women, and children in California live part or all of the year literally "on wheels." In April 1927, the California Department of Education enumerated 37,000 migratory children. The migrants follow the harvests and when these are over the opening of the next season is awaited in the small town and urban slum areas of the State in partial or complete idleness.

The family farm, which still expresses the national ideal, is subordinate in California to the influence of agriculture on an industrialized pattern.

Preface to peasantry, A. F. Raper (*Chapel Hill: Univ. N. C. Press, 1936, pp. XIII+423, [pls. 44, figs. 22]*).—This is a study of rural Negroes and whites living on the fringe of the economic system in Griffin and Macon Counties, Ga., as typical of the cotton-growing sections of the old South.

The relation of density and aggregation of population to the family, D. Sanderson (*[New York] Cornell Sta. Rpt. 1936, p. 138*).—The study shows the proportion of persons married, single, widowed, or divorced, and the age at marriage as associated with the size of the community for native whites of native parentage.

The trend of the marriage rate in rural North Carolina, C. H. Hamilton (*Rural Sociol., 1 (1936), No. 4, pp. 452–471, figs. 6*).—This paper is based on a study of 1,703 families located in representative open-country areas of five North Carolina counties. About one-half of the households were in the two Piedmont areas and the other half in the three Coastal Plain areas. The 15- to 29-yr. age group has been used as a basis for calculating marriage rates.

During the depression years 1932–34 the marriage rate of the relief population was significantly and substantially below that of the nonrelief population. Over a long period of time, however, no significant difference was found.

In two cotton counties, Johnston and Robeson, of the North Carolina Coastal Plain, there appears to be a highly significant correlation between marriage rates and average local cotton prices of the previous year as reported by the North Carolina Department of Agriculture. Young farm people, two-thirds of whom remain on farms, respond to the pressure of economic circumstances in much the same way as their city cousins. In times of poor prices farm youths delay marriage and the beginning of their careers. When recovery sets in, the marriage rate for rural youths responds very quickly because of delayed marriages. Consequently, the marriage rate of the nonrelief population rose substantially in 1933, whereas the marriage rate of households (to be on relief in 1934) continued to decline.

Females marry approximately 3 yr. earlier in life than males. Older males (from 20 to 29) marry at more nearly the same rate as females than is the case with younger males and females. There is no significant or uniform difference in the paces at which the various marriage rates change from year to year.

Beginning as early as 1927, the marriage rates for Negroes, male and female, began to decline, whereas the marriage rates for white persons changed very little. The marriage rate for white females, after dropping slightly in 1929, 1930, and 1931, increased rapidly in 1932 and 1933. The marriage rate for white males was most constant of all, but it followed the white female rate upward in 1932 and 1933.

The marriage rate of the population in or from farm-owner families (as of 1934) was somewhat lower than that of the nonowner group. Marriage rates of owner and nonowner groups are closely and positively correlated, and the rates for both groups have risen since 1931.

The rural church today and tomorrow: A report of the National Conference on the Rural Church (*New York: Home Missions Council and Council*

of Women for Home Missions, 1936, pp. 90).—This is a report of the National Conference on the Rural Church held by the Home Missions Council and the Council of Women for Home Missions, in Washington, D. C., January 13–17, 1936.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Authority of State executive agencies over higher education, J. H. McNeely (*U. S. Dept. Int., Off. Ed. Bul. 15 (1936), pp. 111+57, figs. 48*).—A diagram for each State indicates "schematically the governing boards of the institutions of different types and the particular State executive officials and agencies vested with authority over them. Each specific power conferred on an official or agency dealing with the internal administrative affairs of the institutions has been paraphrased in abbreviated fashion in the diagrams."

Young men in farming, E. R. Hoskins (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 188 (1936), pp. V+117*).—This is a study of young men to determine the qualifications, opportunities, and needs for training in farming, together with derived guidance, placement, and training objectives. Data were obtained by personal visits for 100 young men from 15 to 25 yr. of age in the northern part of Tompkins County, N. Y., of which 38 were fully established in farming and expressed no desire to change occupation, 44 were partly established in and intended to continue in farming, and 18 were not yet established and doubtful as to their desire to continue in farming. Analyses are made showing the attitudes toward farming, the age, physical characteristics, and nationality, education, receipts and expenses before and after leaving school, net worth of the young men, agricultural and human resources and modes of life of the area, the home farms as business enterprises, and family relationships and adjustments. The experience and status of the young men, particularly those established and partly established in farming, are discussed and illustrated by cases. The curriculum objectives in agriculture suitable for such a group of young men are outlined and discussed under the headings of guidance, placement, and training objectives.

FOODS—HUMAN NUTRITION

Foods and nutrition [at the Hawaii Station] (*Hawaii Sta. Rpt. 1936, pp. 58–66, figs. 6*).—This progress report (E. S. R., 75, p. 415) includes brief summaries of studies by C. D. Miller and R. C. Robbins on the nutritive value, including vitamin content, of the papaya; by M. Potgieter, Miller, and Takase on the vitamin content and total and available calcium of the taro; by Miller and Robbins on the absorption of vitamin B from rice bran by Chinese cabbage, daikon, and eggplant when pickled in a paste of salt and rice bran, with tabulated data on the proximate and mineral composition of these vegetables when fresh and bran-salt pickled; by Miller and Robbins on the nutritive value, including minerals and vitamins, of the opihi, and the proximate and mineral composition of the marine alga limu kohu; and by C. J. Hamre and Miller on the blood and blood-forming organs of adult rats in recovery from nutritional anemia.

Report of the Food Investigation Board for the year 1935, F. E. Smith et al. (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1935, pp. X+232, figs. 80*).—The report summarizes the progress of the investigations carried out during the year, including sections on meat; poultry and eggs; pork, bacon, and hams; fish; fruit and vegetables; canning; and engineering.

Correlation of experimental and commercial baking tests, J. Freilich, S. McHugh, and C. N. Frey (*Cereal Chem., 12 (1935), No. 6, pp. 668–691, figs.*

11).—To find a correlation between laboratory and large-scale baking results, a study was undertaken of the different steps in the straight dough procedure, using a typical commercial formula and following the usual baking procedure. Differences were noted between machine molded and hand molded breads and between breads baked in bakery ovens and in the laboratory. Otherwise the differences were very slight, demonstrating that laboratory conditions can be adjusted to produce results equal to those obtained in the bakery if a machine mold is used and the loaves are baked in a small laboratory oven similar in construction to bakery ovens.

The occurrence of acetylmethylcarbinol in bread and its relation to bread flavor, F. V. Hooft and F. J. G. de Leeuw (*Cereal Chem., 12* (*1935*), *No. 3, pp. 213–229, figs. 7*).—Acetylmethylcarbinol has been identified as a constituent responsible for the characteristic flavor of good bread. A method for its determination in doughs and finished bread is given, and the term "acetylmethylcarbinol figure" or "A. F." is proposed to indicate the number of milligrams of acetylmethylcarbinol found in 150 g of bread dough or bread crumb. Factors found to have a favorable influence on the A. F. are high sugar: yeast ratio, diastase preparations, low fermentation temperature, short fermentation time, sponge-dough method, hydrogen acceptors or oxidizing agents and oxygen, and proper yeast selection.

Peanut meal: Food value and uses, L. Ascham (*Georgia Sta. Bul. 195* (*1936*), *pp. 18, figs. 10*).—About 40 standard recipes accompanied by modifications to incorporate peanut meal are presented in this bulletin.

Frozen desserts, P. H. Tracy (*Illinois Sta. Circ. 462* (*1936*), *pp. 28, figs. 17*).—In this revision of Circular 377 (E. S. R., 66, p. 89), the section on types of freezers includes a description of a new motor-driven freezer developed for use in the freezing unit of a household refrigerator, and the section on recipes for the automatic refrigerator has been extended to include quantities of various materials to use for flavoring ice cream, recipes for sirups, and suggestions for a variety of ice cream sundaes.

Studies of numbers and types of microorganisms in frozen vegetables and fruits, A. G. Lochhead and A. H. Jones (*Food Res., 1* (*1936*), *No. 1, pp. 29–39, figs. 2*).—Frozen-pack asparagus, peas, beans, corn, strawberries, and raspberries were studied. The vegetables were packed dry, in water, or in 3 percent brine solution. The fruits were packed in sugar sirup. All products were packed in paraffin-lined cartons and stored at −17.8° C. Duplicate cartons were defrosted at 37°, and the number of coli-aerogenes organisms, anaerobic spores, yeasts, and molds were estimated.

A wide variation was noted in microbial count of freshly packed materials, but this tended to become obliterated during storage. The method of packing did not significantly affect the organism count except with the corn, which contained a considerably larger proportion of bacteria surviving with the water pack. Bacteria predominated in the vegetable packs, while yeasts and molds were more numerous in the acid fruit packs. The coli-aerogenes type of organism decreased during the first 6 weeks of freezing to an insignificant content, while the anaerobic spores persisted in small amounts. The experiments indicate that appreciable amounts of micro-organisms may remain alive even after 9 mo. of storage at −17.8°.

Additional tests showed enormous increases in bacterial count in vegetables defrosted at room temperature for 1½ or 3½ days, with only moderate increases when defrosted at refrigerator temperatures at from 5° to 10°. Relatively smaller increases were noted in the fruits tested under similar conditions. The coli-aerogenes organism increased only in the vegetable samples held at room temperature. Anaerobic spores and coli-aerogenes organisms

showed no development in the fruits. Further tests demonstrated that micrococci and species of *Flavobacterium* survived freezing relatively better than other types of bacteria. The results emphasize that fruits and vegetables, when frozen promptly and kept frozen uninterruptedly, are safe from microbial spoilage, but should be regarded as distinctly perishable products and consumed promptly on defrosting.

[Nutrition studies by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1936, pp. 87, 88*).—Brief notes are given on studies conducted on rats by C. M. McCay, L. A. Maynard, and M. Crowell on the effect of the protein level on health after middle life; basal diets for vitamin B_1 assays, by McCay; and the effect of low levels of fluorine intake on the bones and teeth, by Maynard and G. Ellis.

Food values—what they are and how to calculate them, M. McKillop, rev. by E. C. Mottram (*London: George Routledge & Sons, 1936, [4. ed., rev.], pp. XI+155*).—This volume, the first edition of which has been noted (E. S. R., 36, p. 663), revises and brings up to date the practical application of existing knowledge on nutrition. Following the introductory review of nutrition, the food requirements and vitamins are discussed. "The brown bread controversy" is the subject of one chapter. The remainder of the book is devoted to food value tables and recipes, with calculations on nutritive values.

The significance and accuracy of biological values of proteins computed from nitrogen metabolism data, H. H. Mitchell, W. Burroughs, and J. R. Beadles (*Jour. Nutr., 11 (1936), No. 3, pp. 257–274*).—This contribution from the Illinois Experiment Station describes a series of paired rat-feeding trials in which the proteins of beef round were compared with those of raw peanuts, roasted peanuts, and pecans. Biological values of the proteins were determined by the nitrogen balance method and checked against the comparative nutritive values of the proteins as measured by the growth rates obtained under the paired feeding method, supplemented by carcass analyses.

The biological values of these proteins averaged 76, 58, 56, and 60, respectively. The biological value for a given protein as determined by the nitrogen balance method with a number of individual test animals showed an average standard deviation of 3.7, this tending to be larger the smaller the biological value. The relative nutritive equivalence of two protein mixtures was practically the same whether evaluated by the nitrogen balance or the paired feeding method, indicating that biological values as determined by this laboratory method possess an absolute as well as a relative significance.

Diet in relation to physical efficiency, G. E. Friend (*Brit. Med. Jour., No. 3944 (1936), pp. 276–278*).—The author discusses school and institutional feeding and reviews the conclusions drawn from a 20-yr. survey of the diets of boys living at a hospital school. The various requirements of a normal diet and the division of calories for protein, fat, and carbohydrate advanced by the British Medical Association committee on nutrition are outlined. It is thought that improvement in the health and efficiency of school children would result if the requirements for adequacy could be met and the knowledge acquired through research applied to the question of diet in relation to physical efficiency.

Physical growth of white children: A review of American research prior to 1900, H. V. Meredith (*Natl. Res. Council, Soc. Res. Child Devlpmt. Monog. No. 2 (1936), pp. [3]+83*).—The author presents in chronological order a critical review of research published between 1858 and 1900 dealing with growth in external bodily dimensions of physically normal American white children, ranging in age from birth to 18 yr. An extensive list of literature references is included.

Diets of low-income families surveyed in 1933, D. G. WIEHL (*Pub. Health Rpts. [U. S.], 51 (1936), No. 4, pp. 77–97, figs. 3*).—This is a statistical study of the adequacy of the diet in a large number of low-income families living in New York City, Birmingham, five large industrial cities in the North, South Carolina cotton mill villages, and a mining district of West Virginia. Detailed records of the food supply of each family were kept over a 1-week period, and the results were compared with the Stiebeling and Ward standards of a so-called "adequate" and a "restricted" diet (E. S. R., 70, p. 416).

Among the families living in the five Northern industrial cities having a weekly income of less than $2 per person, the average energy value of the food supply was approximately 20 percent below the adequate standard of 3,000 calories per day per adult male unit, and in one-fourth of these families the average intake was less than 2,200 calories daily. Among the lowest income families, the greatly diminished supply of milk, vegetables, and fruits was very apparent. This deficiency in the protective foods resulted in a diet of very poor nutritional balance, particularly lacking in calcium and vitamins. In Birmingham the average intake at all income levels equaled or exceeded the standard, but the number of families is too few to warrant considering the results typical. In New York City the families with $3–$4 and lower incomes showed an average fuel value of approximately 20 percent below the adequate standard, with the lowest income families including in their diets an adequate amount of vegetables and a minimum amount of milk, with less than the recommended quantities of the cheap high caloric foods such as bread, cereals, potatoes, and dried legumes. In the South Carolina villages and the West Virginia mining towns for each income group the calories averaged more than 3,000 per day per adult male unit. The lowest income families studied in these two States purchased less than half of the recommended amount of milk and included very small quantities of fruits in the diet.

In a previous survey a consistent correlation of the sickness rate with the economic status of the families was demonstrated, and the results of this study show that this was in part due to an unbalanced and insufficient dietary.

Nutrition and national health, I–III, R. MCCARRISON (*Jour. Roy. Soc. Arts, 84 (1936), Nos. 4371, pp. 1047–1066, figs. 3; 4372, pp. 1067–1083, fig. 1; 4373, pp. 1087–1107, figs. 3*).—The three Cantor lectures of 1936, delivered before the Royal Society of Arts, are here given.

I. *Food, nutrition, and health.*—The author reviews the principles of nutrition and surveys his research studies with human subjects and experimental animals to show that nutrition is a vital factor in physiological well-being. Emphasis is placed on the importance of using whole cereal grains, milk and milk products, eggs, fruits, and fresh vegetables in adequate quantities to maintain the structural integrity and functional efficiency of the body.

II. *Relation of certain food essentials to structure and functions of the body.*—This is a discussion of the different parts played by proteins, mineral elements, and vitamins in nutrition and of the effects of their inadequate supply or inadequate utilization when supplied in sufficient quantities. "If the knowledge acquired during the past quarter of a century is to yield its fullest fruit in the betterment of the national health it must be recognized that an optimum supply of all vitamins, in an otherwise well-balanced diet, is a prerequisite of optimum health, and that a minimum supply, while it may suffice for the prevention of certain specific 'defficiency diseases,' creates the conditions precedent to the occurrence of a wide range of other sicknesses. All of which, in regard to vitamins, is not to minimize the great importance of other food essentials in maintaining nutritional harmony and this, in its turn, the melody of health."

III. *National health and nutrition.*—The author discusses the dietary habits and the incidence of disease in different parts of the British Empire. Experimental evidence and reviews of data gained from surveys are presented to show that food of improper constitution and poverty are responsible for a large proportion of the ill health and poor physique of the people. One of the most urgent problems at present is how to insure that each member of the community will receive a diet that will satisfy the physiological needs. "It is clear that to achieve this much-to-be-desired end many barriers—poverty, unemployment, apathy, ignorance, prejudice, habit—must be surmounted, and many interests—agricultural, industrial, and commercial—readjusted." The author stresses the need for greater consumption of milk and green vegetables, better distribution of and storage facilities for perishable foodstuffs in the poorer urban districts, and education of the public in the principles of dietetics.

[**Nutrition in health and disease**] (*Lancet [London], 1936, II, No. 5, pp. 260–262*).—This is an abstract of a discussion before the nutrition section of the British Medical Association at its 1936 meeting. The discussion was opened by R. McCarrison, who reviewed the contacts of the nutrition section with the other sections of the Association. This was followed by discussions by R. A. Peters on the vitamin B complex and its relation to disease, by H. N. H. Green on the fat-soluble vitamins, particularly vitamin A and its relation to infection, by S. S. Zilva on the chemistry of vitamin C as related to its behavior in the body, by D. Hunter on minerals in nutrition, particularly sodium, calcium, phosphorus, and iodine, and by L. Wills on nutritional anemias.

A purified diet satisfactory for growth, reproduction, and lactation in rats, W. M. Cox, Jr., and M. Imboden (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 443–446*).—The authors fed for a period of over 2 yr. and to three generations of rats a diet of casein 20 percent, dextrin 55.1, lard 9, aqueous extract brewer's yeast 4, wheat germ oil 1.6, carotene solution 3 : 1,000 in corn oil 0.3, calcium acetate 1, a mixture of salts 3.1, and rice cellulose 5.9 percent. Growth, reproduction, and lactation on this diet were as satisfactory as when a standard stock diet was used.

The relation of diet to the occurrence of gastric lesions in the rat, E. L. Howes and P. J. Vivier (*Amer. Jour. Path., 12 (1936), No. 5, pp. 689–700, pls. 2*).—Groups of young and adult rats, hooded and albino strains, were placed on a modified Pappenheimer-Larimore (E. S. R., 53, p. 165) lesion-producing diet of flour and salt mixture. After 42 days 90 percent of the young rats developed stomach lesions, accompanied by anorexia, xerophthalmia, and failure to gain weight, while the adult rats remained free from these symptoms for 61 days. When the adult rats were starved every other day, 70 percent developed stomach lesions within 49 days. The young rats showed improved growth when adequate amounts of vitamins A and D were supplied, but 50 percent of them and 60 percent of the adult rats developed lesions. Carotene and butter supplements also failed to protect them. The addition to the diet of 5 percent whole yeast alone or in combination with 5 percent of cod-liver oil or 20 percent of casein protected the young rats from the formation of lesions. An increased quantity of yeast granted protection to the adult rats. When the amount of flour and salt mixture was restricted, 5 percent of whole yeast granted less protection than when a liberal amount of the diet was allowed or when other food factors were supplied. The addition of 10 percent of dried feces to the diet prevented the lesions. The ulcerations occurred in hypertrophied squamous epithelium in the rumen and glandular portions of the stomach. "There is no similarity between these lesions and peptic ulcer in man."

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A study of the dietary factors concerned in nutritional muscular dystrophy, S. Morgulis and H. C. Spencer (*Jour. Nutr., 11 (1936), No. 6, pp. 573–591*).—Muscular dystrophy was observed in rabbits fed on a diet of rolled oats, wheat bran, casein, lard, cod-liver oil, and salts, the whole diet being mixed and treated with either ethereal or aqueous ferric chloride. When the ferric chloride treatment was omitted a few delayed cases of dystrophy occurred, as shown by clinical observation and histological examination. The results were unchanged when corn oil was substituted for the lard in the ration. Fresh green alfalfa and whole wheat germ both prevented and cured the disease, but dried alfalfa, lettuce, vitamin A as carotene in oil, or vitamin E as cold pressed wheat germ oil were ineffective when given singly. When fresh green alfalfa, lettuce and wheat germ oil, dried alfalfa and wheat germ oil, or whole wheat germ were used to supplement the dystrophic diet, prevention and cure were observed.

Two nutritional factors would thus seem to be involved in the prevention or cure of muscle dystrophy. Both factors are present in fresh green alfalfa and in whole wheat germ, one factor is supplied by cold pressed wheat germ oil, and the other is present in lettuce and in dried alfalfa. Drying, extracting with water or alcohol, or treating with ethereal ferric chloride destroys at least one of the factors.

The creatine-creatinine excretion and the creatine content of muscle in nutritional muscular dystrophy, T. G. Ni (*Chin. Jour. Physiol., 10 (1936), No. 1, pp. 199–206*).—In this study nutritional muscular dystrophy was induced in 1-month-old guinea pigs by diet No. II, described by Goettsch and Pappenheimer (E. S. R., 66, p. 796). Preformed creatinine was determined by Folin's method (E. S. R., 31, p. 661), and creatine was estimated as creatinine. Muscle creatine was determined by the method of Rose, Helmer, and Chanutin (E. S. R., 58, p. 509).

The results showed that guinea pigs with symptoms of nutritional dystrophy excreted in 24 hr. in the urine from 22.4 to 53.6 mg of creatine and from 8.1 to 17.2 mg creatinine per kilogram of body weight, while the corresponding excretions for normal guinea pigs were from 6.7 to 14.2 mg creatine and from 20.4 to 22.3 mg creatinine. The muscle creatine for dystrophied animals was found to be from 122 to 375 mg per 100 g of muscle for gastrocnemius, from 175 to 408 mg for adductor magnus, and from 222 to 258 mg for the heart, and for normal animals from 489 to 508 mg, from 465 to 490 mg, and from 227 to 232 mg for the muscle tissues, respectively. The creatine tolerance test showed that the dystrophied animals retained from −15 to +37 percent and the normal animals from 49 to 53 percent.

Muscular dystrophy in young guinea pigs was accompanied, therefore, by a rise in creatine coefficient (milligrams creatine per kilogram of body weight in 24 hr.), a fall in creatinine coefficient, a low creatine content of the muscle except the heart, a decrease in creatine tolerance, and clinical symptoms of paralysis.

The relation between calcium retention and the store of calcium in the body, with particular reference to the determination of calcium requirements, B. W. Fairbanks and H. H. Mitchell (*Jour. Nutr., 11 (1936), No. 6, pp. 551–572, fig. 1*).—In this study at the Illinois Experiment Station, three groups of rats each consisting of 11 or 12 pairs were fed by the paired feeding method. During a preliminary period pairs in group 1 received rations containing 0.18 and 1.25 percent of calcium, pairs in group 2, 0.32 and 1.25 percent, and pairs in group 3, 0.49 and 1.25 percent of calcium. At the end of this period three or four pairs in each group were sacrificed for chemical analyses and the remaining pairs in all groups were fed at the 1.25-percent level until they

attained a weight of 200 g (regardless of the time required to attain this weight), when all were sacrificed for measurements and analyses.

From the data reported it is concluded that the calcium content of growing rats is dependent not only on the calcium content of the diet but also on the rate of growth, which is largely determined by the rate of food consumption. The coefficient of correlation between rate of growth and calcium content of the carcass is found to be -0.929 ± 0.013. This inverse relationship is attributed to the tendency for rapid growth to be associated with (1) slow calcification of the bones and (2) a high ratio of soft tissue to skeletal tissue. Very low levels of calcium in the diet retarded growth not only during the consumption of such a diet but also during the subsequent period of adequate calcium supply.

Differences in the percentage of calcium in the carcasses of various groups at the end of the preliminary period and differences in rate of retention during the subsequent feeding at a high level indicate that the rate of calcium retention by growing animals under conditions of adequate nutrition measures the day-to-day requirement for calcium only when the calcium stores have been saturated by appropriate prefeeding. Otherwise, the observed calcium retentions will be greater than the daily requirements.

A study of the magnesium needs of preschool children, A. L. Daniels, G. J. Everson, et al. (*Jour. Nutr., 11 (1936), No. 4, pp. 327–341, figs. 2*).—Thirty-three calcium, phosphorus, and magnesium balance studies were performed on 10 boys and 3 girls, ages from 4 to 7 yr. The details of the procedure have been reported in a previous study (E. S. R., 75, p. 882).

The magnesium ingestions varied from 11.3 to 19 mg per kilogram, and the retentions ranged from 0.4 to 3.1 mg per kilogram. The uriuary magnesium tended to parallel the magnesium ingestion, and it is suggested that this might be taken as an indication of an adequate magnesium ingestion. The calcium: magnesium ingestion ratios ranged between 2.8 and 6.7 and the calcium: magnesium retention ratios between 3.8 and 30.3, with no relationship between the calcium and magnesium retentions or between the magnesium retentions and the calcium: magnesium ingestions. Of the children studied, 75 percent showed high urinary magnesium, with high retentions following high ingestions of magnesium. "It was concluded tentatively that diets of children of the ages studied should contain not less than 13 mg per kilogram of body weight."

Cholesterol metabolism in children with and without endocrine dysfunctions, M. Molitch and S. Poliakoff (*Arch. Ped., 53 (1936), No. 9, pp. 613–616*).—The subjects were boys aged from 8 to 18 yr. who were inmates of an institution. Approximately 25 percent were found to have some type of endocrine dysfunction.

The total serum cholesterol was determined by a modification of the Sackett method (E. S. R., 54, p. 10). The daily diet included 1 qt. of milk and at least one serving of meat. To test the influence of diet on the cholesterol content, 47 boys were placed on a high fat-high cholesterol intake for 2 weeks by adding to the daily diet ½ lb. of meat organs or several eggs. The average rise in serum cholesterol was 12 mg per 100 cc above the level before the special diet was given. It appeared that the serum cholesterol depended to a certain extent upon the fat and cholesterol contents of the diet.

The control group consisted of 284 normal boys. Its total serum cholesterol was found to range from 81 to 204 mg per 100 cc, with 85 percent of the group beween 100 and 160 mg per 100 cc and the average 130.7 mg. The 157 subjects with endocrine dysfunction, with one exception, showed a range of total serum cholesterol between 81 and 200 mg per 100 cc, with 79 percent of the group between 100 and 160 mg and 91 percent between 100 and 180 mg per 100 cc.

These values were within the normal range of total serum cholesterol. The authors confirmed Rothbart's findings (E. S. R., 73, p. 879) in that no correlation was found between total serum cholesterol, basal metabolism, and mental level.

Cytophysiological study of the action of vitamin A [trans. title], P. JOYET-LAVERGNE (*Bul. Soc. Chim. Biol., 18 (1936), No. 6, pp. 1041–1054*).—The author reviews the cytophysiological studies on vitamin A and summarizes the results of his investigations on the presence of vitamin A in the nucleolus and chondrioma of plant and animal cells. When vitamin A is lacking, cell multiplication ceases and growth is limited, showing that vitamin A is a growth factor. The role of vitamin A in metabolism appears to be that of an independent factor in catalysis. The manifestations of avitaminosis A are attributed to its indispensable function as catalyst of oxidation and reduction processes.

Changes in the vaginal epithelium of the rat on an excessive vitamin A diet, T. C. SHERWOOD, M. A. BREND, and E. A. ROPER (*Jour. Nutr., 11 (1936), No. 6, pp. 593–597*).—A group of 18 female rats 150 days old receiving a complete diet was examined at 8-hr. intervals for the normal vaginal smear content until 8 complete oestrous cycles had been determined. The animals then received as supplement 1,500 international units of carotene daily for 15 days. The vaginal smear technic was continued during and following carotene administration until 8 normal oestrous cycles had again been observed. This procedure was repeated with another group of 16 female rats 150 days old receiving 3,750 international units of carotene daily for the 15-day period.

Examination of the vaginal smear picture showed no deviation from normal in the control rats receiving the normal diet, with or without the addition of cottonseed or corn oil. Following carotene administration to the experimental animals, abnormality was apparent within 2 days. Nucleated epithelial cells predominated at all stages of the oestrous cycle, and leucocytes were continuously present, while the cornified cells were rare or absent. The cycle did not return to normal until 20 days after cessation of the carotene feeding.

Lesions of the nervous system in vitamin deficiency.—IV, The effect of carotene in the treatment of the nervous disorder in rats fed a diet low in vitamin A, H. M. ZIMMERMAN and G. R. COWGILL (*Jour. Nutr., 11 (1936), No. 5, pp. 411–423, figs. 2*).—Continuing an earlier study (E. S. R., 69, p. 311), young rats were maintained from weaning on an artificial diet deficient in vitamin A but containing hydrogenated vegetable oil and linoleic acid. Some animals received prophylactic doses of carotene, others received curative doses, and the remainder were fed the vitamin A-deficient diet without supplement. Tests were employed to study evidences of neurological manifestations, and at post mortem the sciatic nerves, brachial plexuses, spinal cord, and cerebrum were examined microscopically.

The results obtained in the previous study were confirmed by this investigation, i. e., "that rats subsisting on an artificial ration low in vitamin A often develop neurologic manifestations of disease which are due to demyelination of the peripheral nerves and spinal cord." The administration of carotene in inadequate dosage of 50 μg (micrograms) given late in the course of the deficiency did not prevent the occurrence of the neurological symptoms and death. The aminals receiving an adequate dosage of carotene, 100 μg, relatively early in the course of the deficiency were restored to good health, with the neurologic disorder persisting to an even more marked degree than in the untreated animals. The daily administration of 50 μg of carotene throughout the experiment was effective in preventing the development of the nervous disorder, but since the presence of linoleic acid in the diet did not prevent it, vitamin A

rather than the presence or absence of unsaturated fatty acids is evidently the factor.

[**The physiological mechanism of avitaminosis A**] (*West Virginia Sta. Rpt. 278 (1936), pp. 27, 28*).—This progress report (E. S. R., 72, p. 728) deals with the water metabolism of rats and of dogs (E. S. R., 75, p. 727) in vitamin A deficiency.

The vitamin-B and -G content of commercial beer, P. B. Donovan and M. E. Hanke (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 538–543*).—Five samples of commercial beer, three of which were advertised as a source of vitamins, were fed at dose levels ranging from 2.5 to 30 cc per day. The experimental animals were 21-day-old rats depleted of the vitamin B complex for 2 weeks following weaning and before being placed on the test doses.

The results, based on rat growth and survival when 0.4 g of dried yeast or the beer supplements were fed, show that pasteurization did not affect the vitamin B complex concentration. Filtration through sintered glass did not appreciably change the vitamin content, whereas filtration through paper caused a loss of some vitamin B and nearly all of the vitamin G. When the three beers which were advertised as a source of vitamins were fed at the 10-cc level, the rats showed approximately 50 percent more growth than was shown by the rats receiving other beers.

That the limiting factor in the growth of rats receiving beer supplements is vitamin B was shown by feeding B extract containing a minimal amount of vitamin G and autoclaved yeast containing a minimal amount of vitamin B. The addition of vitamin B extract increased the growth rate to the level attained by the positive control rats, a level not reached when autoclaved yeast was fed. The approximate concentration of vitamin B in the beers tested was calculated to range from 0.05 to 0.1 Sherman unit per cubic centimeter. The concentration of vitamin G was considerably greater. These results show that beer is a wholly inadequate source of vitamin B for the rat.

The B-vitamins in human urine, M. H. Roscoe (*Biochem. Jour., 30 (1936), No. 6, pp. 1053–1063, fig. 1*).—During a period of 12 days on an ordinary hospital diet, with and without the addition of a known amount of vitamin B complex, the amounts of vitamins B_1 and B_2 in the urine of three normal subjects and one case of "alcoholic" polyneuritis were estimated by methods similar to that of Harris et al. for vitamin C (E. S. R., 72, p. 568). The total urine for each subject during each period was concentrated to 1 l and fed to rats deprived of vitamin B_1 or B_2, respectively. The vitamin B_1 activity was estimated by a curative method and the vitamin B_2 activity by a growth method, using rats as the experimental animal.

No vitamin B_1 could be found in the urines of subjects receiving the ordinary hospital diet. When 720 international units of vitamin B_1 daily were added to the diet, 167–333 international units of the vitamin were excreted in the urine and the remainder of the additional intake was assumed to have been retained. When the subjects were receiving the hospital diet, small quantities of vitamin B_2 were present in the urines. The addition of supplementary vitamin B_2 caused increased excretion and apparently increased retention. In the case of the alcoholic polyneuritic the initial amount of the vitamins excreted was comparable with that of the normal subjects. When additional vitamins were given, the vitamin B_1 retention appeared to be slightly less and the vitamin B_2 retention slightly greater than those observed in the normal subjects.

Role of adenylic acid in vitamin B_1 deficiency, T. W. Birch and L. W. Mapson (*Nature* [*London*], *138 (1936), No. 3479, pp. 27, 28, fig. 1*).—The action of adenine nucleotides on the heart of both the normal and the vitamin B_1-

deficient animal was studied. It was found that the bradycardia present in rats deficient in vitamin B_1 was increased when adenosine or adenylic acid from muscle or yeast was injected. A much smaller effect was produced in normal animals. "These results suggest that the B_1-deficient animal is unable to render these compounds innocuous at the same rate as does the normal animal." The authors have established the fact that deaminase activity of vitamin B_1-deficient cardiac tissue is approximately 20 percent lower than that of similar tissue from animals adequately fed. The deaminase activity became normal in 18 hr. after the administration of vitamin B_1. All attempts to obtain this restoration by the direct addition of vitamin B_1 to deficient tissue in vitro have been unsuccessful. This failure of the deaminase mechanism may result in the increased accumulation of adenylic acid in the tissue, which is the cause of bradycardia. Other effects obtained with vitamin B_1-deficient tissue, such as increased lactic acid and decreased oxygen consumption, may be due to the inhibition by adenylic acid of the oxidative mechanisms which are responsible for the removal of the metabolites.

Successful treatment of human pellagra with the "filtrate factor", P. J. Fouts, S. Lepkovsky, O. M. Helmer, and T. H. Jukes (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 245–247*).—In this preliminary report the results are summarized of the treatment of 4 pellagrins on a pellagra-producing corn diet with concentrates of various factors of the vitamin B complex.

No improvement was noted following continued treatment of two of the patients with 10 and 20 mg, respectively, daily of lactoflavine, but when this was replaced by 6 vials daily of liver extract (derived from 600 g of liver) there was rapid improvement in all of the symptoms. The treatment of a third patient with 35 cc daily of the concentrate of the filtrate factor (chick antidermatitis) of Lepkovsky et al. noted on page 839 was followed by very marked improvement. After 10 days the mouth was normal, there was no diarrhea, and only an increase in pigmentation of the skin over the involved parts remained of the dermatitis. The fourth patient, who had severe polyneuritis in addition to the pellagric symptoms, was given 20 cc daily of a concentrate of vitamin B_1 prepared as described by Stuart et al. (E. S. R., 72, p. 443). After 4 days the general condition had improved and the caloric intake had increased, but the dermatitis, diarrhea, and stomatitis grew worse. The filtrate factor was then administered daily in 50-cc doses, with complete disappearance of the diarrhea in 3 days and rapid improvement in the dermatitis and stomatitis.

"Pellagrins can be cured while on a maize diet by the administration of a liver filtrate which contains the chick antidermatitis factor but which is free from lactoflavine and rat vitamin B_6."

Viltamin sources, XVIII, XIX [trans. title], T. L. Isumbudowa (*Ztschr. Untersuch. Lebensmtl., 71 (1936), No. 4, pp. 324–330*).—Two papers are presented.

XVIII. *Antiscorbutic concentrates from sorrel* (pp. 324–326).—Guinea pigs were protected from scurvy when 0.3 g of sorrel juice, acidified to pH 2.90–2.99 with hydrochloric acid, was fed daily. Signs of scurvy were evident in animals receiving the sorrel juice without added hydrochloric acid. From the results of biological tests it was estimated that 1 kg of the acidified concentrate contained 3,000–5,000 units of vitamin C. Applying the Tillmans titration method, values of 2,100–2,200 units per kilogram were obtained.

XIX. *The effect of freezing on the antiscorbutic activity of potatoes* (pp. 326–330).—Biological tests were made on groups of guinea pigs with two varieties of potatoes. The results show that storage of the potatoes at temperatures of from −13° to −16° C. preserved the vitamin C content, 1 kg

containing at least 168 units. Potatoes stored at a temperature not lower than from 2.5° to 3° showed a loss of antiscorbutic potency. In tests made on the cooked potatoes it was found that slightly greater loss of antiscorbutic potency resulted when the frozen potatoes were immersed in cold water before cooking than when hot water was used. The animals receiving 0.6 g daily of frozen potatoes which had been immersed in hot water before cooking were protected from scurvy.

The preceding paper in the series is by Jarussowa (E. S. R., 75, p. 571).

Distribution of vitamin C in different parts of common Indian foodstuffs, M. N. RUDRA (*Biochem. Jour., 30 (1936), No. 4, pp. 701–703*).—The ascorbic acid content of different parts of various Indian fruits and vegetables and a few animal foods was determined by the indophenol method. In the fresh and young fruits and vegetables the ascorbic acid was more concentrated in the skin than in the flesh, but this was reversed when the food had been stored or dried. Various organs and tissues of the goat gave the following values: Liver 0.263 mg per gram, kidney 0.176, bone marrow 0.088, milk 0.085, heart 0.077, and muscle 0.66 mg per gram.

The vitamin C content of human milk and its variation with diet, I. SELLEG and C. G. KING (*Jour. Nutr., 11 (1936), No. 6, pp. 599–606*).—Values obtained by the indophenol titration technic, as described by Bessey and King (E. S. R., 71, p. 137), are given for the vitamin C content of human milk. Orange juice providing varying amounts of vitamin C per day was given to some groups of patients, the remainder receiving the good hospital diet without supplement.

The vitamin C content of human milk determined in the 53 patients at the beginning of the experiment varied from 0.012 to 0.108 mg per cubic centimeter, the average being 0.055 mg. The patients without orange juice supplement showed a gradual rise in the average value of vitamin C to reach 0.064 mg per cubic centimeter of milk on the tenth day post partum. The corresponding values for the two groups receiving orange juice supplement equivalent to 210 and 430 mg of vitamin C per day rose to 0.073 and 0.081 mg. The range of vitamin C was approximately 0.06–0.08 mg per cubic centimeter of milk when the mother was receiving an adequate diet. This indicates that the normal requirement of vitamin C per day for an infant may be established from the amount supplied in mother's milk when the diet of the parent is adequate. Under optimum conditions, with a fluid intake of 21 oz., a child might receive from 40 to 50 mg of vitamin C daily in the first few weeks of life.

Quantity of vitamin C necessary to maintain the normal reducing value of animal tissues [trans. title], D. DE CARO (*Hoppe-Seyler's Ztschr. Physiol. Chem., 240 (1936), No. 3–4, pp. 179–190, fig. 1*).—The adrenals of guinea pigs maintained on a vitamin C-free diet were studied. The content of vitamin C in the tissues was determined at various stages during the development of scurvy and the curative period by titration with 2,6-dichlorophenolindophenol. The rate of disappearance of vitamin C from the adrenals was found to be roughly represented by an exponential curve.

Injections were more potent than oral administrations in maintaining the normal concentration of ascorbic acid in the adrenals and liver. Larger amounts than the ordinary protective dose against scurvy were required. More effective results were obtained when the oral administration was given as a natural constituent of the food than in aqueous solution.

The injection of 12 mg of isoascorbic acid gave similar results to those obtained by injections of 5 mg of ascorbic acid in protecting the guinea pigs and maintaining the normal reducing power of the adrenals. It is suggested

that the presence of ascorbic acid in normal concentration in the tissues provides a necessary condition for optimum cell activity rather than acting as a reserve.

Vitamin-C deficiency in Addison's disease, J. F. WILKINSON and C. A. ASHFORD (*Lancet [London], 1936, II, No. 17, pp. 967–970*).—Three women patients with Addison's disease were shown to be suffering from vitamin C subnutrition when diagnosed by the method of Harris and Ray (E. S. R., 73, p. 427). The degree of subnutrition ran parallel to the severity of the symptoms. The possible significance of the finding and the relationship of vitamin C to pathological pigmentation are discussed.

Experiments confirming the antiscorbutic activity of dehydroascorbic acid and a study of its storage and that of ascorbic acid by the guinea-pig at different levels of intake, F. W. FOX and L. F. LEVY (*Biochem. Jour., 30 (1936), No. 2, pp. 211–217, fig. 1*).—Young guinea pigs were placed on the scurvy-producing diet described by Bracewell et al. (E. S. R., 64, p. 497) supplemented by dehydroascorbic acid, which was prepared from orange juice treated with norite. At the end of the 14-week experimental period, scurvy was not present in any of the test animals. One animal born during the experiment was successfully reared on the diet with oxidized vitamin supplement.

Following the method of Birch et al. (E. S. R., 70, p. 741), the amount of antiscorbutic vitamin in the livers and adrenals of the animals was estimated. It was concluded that the guinea pig has a small and definite capacity for storing the vitamin in the liver and that dehydroascorbic acid is not as easily stored as ascorbic acid. Further experiments to determine the ascorbic acid content of the liver and adrenals of guinea pigs killed after 10 days on the scorbutic diet showed that the amount of ascorbic acid stored is closely dependent upon the actual level of intake.

Rachitogenic factors in cereals [trans. title], O. RYGH (*Bul. Soc. Chim. Biol., 18 (1936), No. 6, pp. 1091–1096*).—The vitamin D content of oats was determined by the method of Poulsson and Lövenskiold (E. S. R., 59, p. 293). The fat was extracted from the oats, saponified, and the fatty acids recovered from the saponified fraction. The unsaponifiable fraction contained approximately 880 international units of vitamin D per gram, which was equivalent to 6 international units per gram of whole oats. The fatty acids from the saponifiable fraction were found to be actively rachitogenic. The fatty acids derived from the fat of green plants exhibited antirachitogenic activity and when fed to the test animals receiving doses of fatty acids derived from oats the rachitogenic effect was neutralized. When sufficient caustic soda was added to partially neutralize the fatty acids from oats, the unneutralized portion became more potently rachitogenic. Fractional distillation destroyed the rachitogenic action of the fatty acids.

Effects on the fetus of hypervitaminosis D and calcium and phosphorus deficiency during pregnancy, L. W. SONTAG, P. MUNSON, and E. HUFF (*Amer. Jour. Diseases Children, 51 (1936), No. 2, pp. 302–310, fig. 1*).—This is an investigation of the relationship between abnormalities of the intake of minerals and vitamin D by the mother and mineralization of the rat fetus. The experimental animals were eight litters of 30 virgin rats maintained on a modified Sherman B diet. The animals were bred and following conception were subjected to one of four procedures: A control group received the stock Sherman diet during pregnancy; group 2 received a diet deficient in calcium, phosphorus, and vitamin D; group 3 received the deficient diet supplemented by 0.2 cc of viosterol 2,700 D; group 4 received the deficient diet supplemented by graded doses ranging from 0.08 to 0.15 cc of viosterol. Immediately after parturition the newborn rats were killed, weighed, and ashed, and calcium and phosphorus

determinations were made. Roentgenograms were made of the rat mothers immediately after conception and after parturition.

The data, based on findings with 19 litters, demonstrate that the offspring of rats that received a diet deficient in calcium and phosphorus had a lower calcium and phosphorus content than the offspring of the control rats. The calcium and phosphorus contents of the offspring were not increased by the administration of high doses of vitamin D to the rats receiving the mineral-deficient diet during gestation. The weight of the offspring was decreased when vitamin D, calcium, and phosphorus were lacking in the mother rat's dietary. The offspring of rats on the deficient diet, with and without vitamin D, showed a higher calcium : phosphorus ratio than did the offspring of the rats receiving graded doses of vitamin D, or the control rats. The experiment indicates that the mineral content of the offspring is dependent upon the mineral metabolism of the rat mother.

The success of treating celiac disease from a standpoint of vitamin deficiency, C. V. Rice (*Arch. Ped., 53 (1936), No. 9, pp. 626–629, figs. 2*).—The author reports the successful treatment of celiac diseases in three children by a dietary regime containing high vitamin sources. A detailed account of one case is given. The diet included fat in the form of evaporated milk, sugar as wheat germ sugar, and vitamin concentrates.

Note on the non-identity of lactoflavin and the "extrinsic factor" in pernicious anaemia, C. A. Ashford, L. Klein, and J. F. Wilkinson (*Biochem. Jour., 30 (1936), No. 2, pp. 218–223*).—In continuation of the series of papers noted previously (E. S. R., 73, p. 889), the authors studied the hemopoietic activity of lactoflavine. Three human subjects failed to respond to parenteral administration of lactoflavine alone or incubated with the fraction P 5 [the active fraction prepared by alcoholic precipitation of the press juice from hog's stomach] (E. S. R., 71, p. 140), or to the intramuscular administration of lactoflavine incubated with normal gastric juice. These results show that lactoflavine is neither the liver antipernicious anemia principle nor the extrinsic factor concerned in hemopoiesis.

The anemia of deaminized casein, M. I. Smith and E. F. Stohlman (*Pub. Health Rpts. [U. S.], 51 (1936), No. 24, pp. 772–786, figs. 7*).—The authors describe a series of feeding experiments showing that the anemia of deaminized casein, as described by Hogan and Ritchie (E. S. R., 72, p. 892), is an intoxication and not a deficiency disease. Groups of rats were placed on a diet in which deaminized casein was the sole protein source, one in which lysine, tyrosine, and histidine had been added in amounts approximately equivalent to those present in casein when fed at the optimum level of 18 percent, and diets supplemented with 5 and 12 percent dried brewers' yeast, 5 percent casein and 5 percent dried brewers' yeast, and 15 percent casein and 5 percent dried brewers' yeast. None of the experimental animals was completely protected from anemia. Treatment with liver extract of a group of anemic rats appeared to have no effect on the blood picture and no influence in arresting the progress of the anemia. The experiments indicated that in animals receiving a diet containing adequate protein in addition to the deaminized casein the red blood cells and hemoglobin did not fall so rapidly nor to as low a level as they did in the less adequately supplemented diets. The authors interpret the results as follows: "First, the nutritive value of deaminized casein is low or nil; second, deaminized casein appears to contain an unidentified toxic factor highly specific for the blood elements."

A residue was prepared from deaminized casein by suspending 25 g of deaminized casein in 400 cc of methyl alcohol containing 6–7 cc of 9 N sodium hydroxide in an Erlenmyer flask, refluxing in a water bath at 72°–75° C. for

½ hr., filtering, washing with methyl alcohol and with ether, and drying. This residue fed at a level of 10 percent as the sole source of protein was wholly inadequate when judged by weight curves and periods of survival, but no evidence of anemia could be found. A group of rats fed 5 percent of yeast protein in the form of 12 percent of dried brewers' yeast demonstrated a moderate degree of anemia. In another group on a diet in which 15 percent of casein was included in addition to the "detoxified" deaminized casein only one of seven rats had a red cell count and hemoglobin slightly below normal. "These results seem to prove conclusively that the anemia-producing and growth-inhibiting factor or factors of deaminized casein are to a large extent removed or destroyed by boiling with alkaline methyl alcohol."

An extract of the detoxified product was distilled in vacuo, and the residue was taken up in a small amount of water, neutralized with hydrochloric acid, dried on starch, and incorporated at a level corresponding to 10 percent of deaminized casein in a ration containing 12 percent of dried brewers' yeast as the sole source of protein for 3 weeks and 6 percent for the following 3 weeks. Both rats on the experiment showed a normal blood picture at the end of the period. "It may be concluded . . . that the hematoxic factor in the deaminized casein had not been extracted but was largely destroyed by boiling with alkaline methyl alcohol."

When detoxified deaminized casein, reprecipated by HCl and filtered, was fed to one group of rats and the filtrate concentrated to a small volume was injected into another group, none of the animals developed anemia.

In order to identify the toxic substance, various extracts of deaminized casein were prepared and their effects on the blood picture were studied. The only way to recover the toxic factor was by rather drastic hydrolysis of the deaminized casein with hydrochloric acid. The residue so obtained produced anemia when tested in rats. "This would seem to indicate that the toxic factor is so firmly bound to the protein molecule that it could not be liberated without the more or less complete disintegration of the protein." Three preparations of partially active hydrochloric acid hydrolysates of deaminized casein are described which, when injected intraperitoneally in rats, produced the morphologic changes in the blood picture of the majority of the animals, thus furnishing conclusive evidence of the toxic nature of the anemia of deaminized casein.

TEXTILES AND CLOTHING

A series of technical studies on unweighted and weighted silk, I–V (*Rayon and Melliand Textile Mo., 16 (1935), No. 12, pp. 39–41, 48, fig. 1; 17 (1936), Nos. 1, pp. 49–53, figs. 5; 2, p. 66, figs. 3; pp. 67, 68, figs. 4; 3, pp. 36–38, figs. 2; 4, pp. 72, 73, fig. 1; 5. pp. 35, 36, figs. 4; 6, pp. 65, 66, fig. 1*).—The following papers are taken from the report of a series of 12 studies on unweighted and weighted silks made at the Pennsylvania State College:

I. *The effect of the tin-weighting process on the strength of new silk*, W. M. Forbes and P. B. Mack (pp. 39–41, 48).—Three series of tests were made on silk fabrics prepared from satin-faced crepe. In series 1, one sample was unweighted while the other five were passed from one to five times through a stannic chloride-disodium phosphate bath. In the same manner the samples of degummed silk in series 2 and 3 were weighted without being given a commercial finishing. To determine the degree of weighting the samples were immersed successively in water at 65° C., alcohol and ether, 2 percent hydrofluoric acid at room temperature, and 2 percent sodium carbonate at 65°. The percentage content of the material other than fibroin, the mineral weighting,

and the ash values were obtained. The effects of weighting on the strength of the new silk were studied by testing the breaking strength, bursting strength, tear resistance, and abrasion resistance.

The results show that with increased weighting the breaking strength and the ability to withstand tear resistance were decreased. The abrasion-resistance test showed that after 1,000 rubs on the testing machine the weighted samples were less resistant to tearing strain. The unweighted silks resisted breakage after 2,000 rubs, while the weighted samples ruptured, the greatest damage being noted in the more heavily weighted silks.

II. *A study of the effects of light and air on unweighted and tin weighted silk*, N. M. Roberts and P. B. Mack (pp. 49–53).—Using samples of the same silk fabrics as in the above study, and others of a similar weave, the weighting process was carried out by two different methods. The weighting determinations and physical tests were made as above. Further tests were done to determine the effects of aging in the absence of light, in indoor daylight, by irradiation with a sunlight (S–1) lamp, and in evacuated tubes in the dark.

The weighted samples to which a commercial dressing had been applied were considerably lower in breaking strength than were the undressed samples of about the same percentage of weighting. Although the loss in breaking strength after aging was not as great as in the dressed silks, this saving in durability did not compensate for the loss in breaking strength. Aging for 6 mo. in the dark produced slightly greater losses in breaking strength in the unweighted and lightly weighted samples than was produced by irradiation for 100 hr. with a sunlight lamp. In the heavily weighted samples the greatest loss was produced by irradiation in the air and in evacuated clear quartz tubes, with less loss after storage in the dark. In the unweighted and lightly weighted samples less loss in breaking strength was produced by 100 hr. of irradiation than by 4 months' exposure to indoor daylight.

III. *The effect of darkroom storage on unweighted and tin weighted silk*, A. A. D'Olier and P. B. Mack (p. 66).—Tests were made on the same fabrics as above to determine the effect of from 6 to 31 mo. of darkroom storage on the breaking strength of the silks. The results show that the breaking strength decreased progressively as the percentage content of a weighting material increased and was greater in the samples to which a commercial dressing had been applied.

IV. *The effect of tin weighting on the air permeability of silk*, N. M. Roberts and P. B. Mack (pp. 67, 68).—Previously noted (E. S. R., 67, p. 781).

V. *The effect of drycleaning and of water washing on the strength of unweighted and of tin weighted silks, parts 1–4*.—This presents the subject matter in four parts, as follows:

Part 1. *The effect of drycleaning, stains, stain removal agents, and pressing*, E. C. Ramsay and P. B. Mack (pp. 36–38).—Silks from the same bolts as in the previous studies but with different amounts of weighting were used. The standard procedure for cleaning silks was repeated from 1 to 15 times on each fabric. Nine representative types of stains were applied in studying the effect of the stain alone, the stain and the removal reagent, and the reagent alone. The fabrics were ironed with an electric hand iron, a steam-heated flatwork iron, and a hand steam iron. One of each series of fabrics after 15 dry cleanings was pressed with a hand steam iron.

Dry cleaning alone produced very little effect upon the breaking strength of the fabrics. The stains and spotting reagents of an acid character had a tendency to reduce the breaking strength in both unweighted and weighted fabrics, the action being more apparent in the latter group. Oily stains and

volatile spotting agents showed very little effect, but serious loss of breaking strength was noted when fountain pen ink, mercurochrome, rust, perspiration, tannin, black carbon ink, iodine, and blood were allowed to remain on the fabric for 3 weeks. Spectroscopic examination revealed that the tin was removed from the tin-silk combination in the weighted silk by the acid present in the stain or removal agent.

In the pressing process the new silk was more tender following the application of dry heat than moist heat. The steam-heated flatwork ironer had less tendering effect than the steam hand iron. The fabrics which had been dry-cleaned before pressing did not show any greater losses in breaking strength.

Part 2. *The effect of various drycleaning solvents on unweighted and on tin weighted silks*, M. D. Hale and P. B. Mack (pp. 72, 73).—In cleaning a typical pure-dye flat crepe silk containing 5.9 percent dressing and a tin weighted sample containing 55.48 percent dressing and weighting there were used carbon tetrachloride, trichloroethylene, perchloroethylene, Dow Solvent 68, and orthodichlorobenzene. The fabrics were dry cleaned for 25 min. by the following methods: (1) Predried for 1 hr. in an 85° C. drying oven and cleaned with solvent alone, (2) humidified in an atmosphere of 100 percent relative humidity for 1 hr. and cleaned in solvent alone, (3) preheated for 1 hr. and cleaned with solvent to which 2.5 percent of anhydrous potassium oleate soap had been added, and (4) humidified and cleaned with the solvent and soap. The fabrics were all brought to constant weight in an 85° oven before the breaking strength measurements were made.

Predrying caused only slight losses in breaking strength, and the pure-dye silks showed less losses than the tin-weighted silks. When soap was used, slightly greater losses were shown by the pure-dye silks, with only slight differences noted in the weighted silks. All of the synthetic solvents tested caused losses greater than 40 percent when soap was used and the fabrics were prehumidified, as compared with approximately 20 percent losses when the fabrics were predried.

Part 3. *Practical drycleaning trials of miscellaneous silks*, C. R. Phillips and P. B. Mack (p. 73).—To determine how weak silk fabric need be in order to break during the commercial dry-cleaning process, the breaking strengths of 18 silk fabrics in varying stages of aging were measured before and after the dry-cleaning process. The fabrics were dry cleaned for 25 min. in a commercial machine, using Stoddard Solvent and 2.5 percent of anhydrous potassium oleate soap, followed by a 15-min. rinse in clear solvent.

The resulting losses in breaking strength varied from 0 to 19.8 percent, with rupture occurring only when the initial strength in the weaker direction was very low. More satisfactory results were obtained in dry cleaning the pure-dye silk fabrics than the weighted silk, spun silk, or silk fabrics with discharge printed designs which had been aged.

Part 4. *The effect of water-washing upon the strength of unweighted silks*, B. Cohen and P. B. Mack (pp. 35, 36, 65, 66).—The six fabrics tested were those described in paper 1 as a graduated series with respect to the degree of weighting. The following treatments were administered: (1) Soaking in distilled water for 2, 7, 12, and 24 hr. at 18°, (2) soaking in distilled water for 2 hr. at 18°, 38°, 50°, and 100°, (3) soaking for 7 hr. at room temperature in distilled water containing 8 grains each of hardness from both calcium carbonate and magnesium sulfate, (4) soaking in distilled water for 2 hr. at 50°, containing various kinds of soap, and (5) washing for 2 hr. at 50° by various home methods. In addition 11 miscellaneous weighted and unweighted silks were laundered in one commercial and two home electric washers.

The strength losses became progressively greater as the time of soaking was increased, and were greatest in fabrics of intermediate degrees of weighting. After the 2-hr. soaking period the least losses were shown in the most heavily weighted silks and the pure-dye silks. However, with longer soaking periods, these fabrics showed proportionately greater percentage of shrinkage than the intermediate weighted fabrics. The losses increased as the temperature of the water was increased, with the heavier weighted fabrics showing the lowest loss at 18°. Shrinkage increased only slightly with temperature increases and was greater at all temperatures for the fabrics of intermediate weighting content. Soaking in distilled water caused smaller losses than in hard water, with the fabrics of the lowest weighting content showing the greatest losses in the hard water. Excessive strength losses and shrinkage resulted in all fabrics soaked in water containing alkaline soap with and without rosin. Neutral soaps and water caused strength losses and shrinkage slightly less than that caused by distilled water.

The mechanical action tests demonstrated that greater tendering effect and shrinkage resulted from rubbing the fabric between the knuckles, squeezing between cupped hands, and rubbing on the washboard. Washing with the vacuum type of washing machine produced the least tendering effect except with the most heavily weighted fabrics, which showed the best results after the process of squeezing with the cupped hands.

The losses in breaking strength of the miscellaneous silks increased with increases in weighting. No definite trends could be demonstrated for shrinkage tests because the fabrics were of different weaves. Generally, the strength losses of all fabrics were practically the same for the commercial washer and the two types of home washing machines.

A modified method for measuring wool damage due to scale breakage, J. H. Kettering (*Jour. Home Econ., 28 (1936), No. 4, pp. 255–259, fig. 1*).—This test, as developed in the U. S. D. A. Bureau of Home Economics, is used to determine accurately the extent to which undyed fibers or fabrics have been damaged during the manufacturing process or subsequent service, and it also indicates the amount of service a fabric may be expected to give. The method, which is a modification of the Rimington-Pauly test, is as follows:

"To a mixture of 10 cc of 10-percent sodium sulfanilate and 5 cc of 8-percent sodium nitrite, add 2 cc of concentrated hydrochloric acid, shake gently, and let stand for 1 min. Then add this mixture to 15 cc of 9-percent sodium carbonate solution which contains a 0.1-g sample of the wool weighed under standard conditions, and allow to stand exactly 10 min. Remove sample, wash it in a sintered glass crucible with 300 cc distilled water, and dry it on a watch glass in a dark room. When dry add the sample to 50 cc of 2 N sodium hydroxide and allow to stand for 18 hr. Shake well and compare this solution with 0.1 percent New Acid Brown S, using colorimeter and artificial light." The dye solution should be prepared the previous day and filtered immediately before use. The reactions should be performed in a constant temperature laboratory kept at 70° F.±1°, and all solutions should be brought to that temperature before beginning the test.

Using this modified procedure, reproducible results were obtained from fabrics both slightly and extensively damaged. The values obtained were correlated to the strength index and showed a linear relation existing between the results of the revised test and of a physical measure of deterioration.

Guides for buying sheets, blankets, and bath towels, B. M. Viemont, M. B. Hays, and R. O'Brien (*U. S. Dept. Agr., Farmers' Bul. 1765 (1936), pp. [2]+28, figs. 10*).—This presents guides to aid the housewife in judging the

durability and drying qualities of bath towels, such as knowledge of the length and width of the towel, the colorfastness, the amount and rate of water absorption, the number of filling and warp yarns to the inch and their breaking strengths, the weight per square yard, and the number of square inches of terry in the entire towel. Revisions of the material as to sheets and blankets contained in Leaflet 103 (E. S. R., 71, p. 142) and Leaflet 111 (E. S. R., 73, p. 573) are also included.

MISCELLANEOUS

An outline of biometric analysis, A. E. Treloar (*Minneapolis: Burgess Pub. Co., 1936, [2. ed.], pp. [12]+193, figs. [44]*).—This outline "has in view the aiding of students in grasping the fundamentals of courses in biometric analysis, given by the author at the University of Minnesota, and its contents are entirely limited by the demands of that teaching."

Partners in agricultural progress: [Biennial Report of California Station, 1935–36], C. B. Hutchison and **S. G. Rubinow** (*California Sta. [Bien.] Rpt., 1935–36, pp. IX+230, pls. 23*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Hawaii Agricultural Experiment Station, 1936, [O. C. Magistad et al.] (*Hawaii Sta. Rpt. 1936, pp. 96, figs. 16*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Index to Vols. 1–18 (inclusive) (*Michigan Sta. Quart. Bul., 1936, Index vols. 1–18, pp. 68*).—This includes both subject and author indexes.

Farm Research, January 1, 1937 (*Farm Res. [New York State Sta.], 3 (1937), No. 2, pp. 14, figs. 6*).—In addition to papers noted elsewhere in this issue, the following are included: Holland's Contribution to Cheese Making, by C. D. Kelly (p. 6); The Seed Situation for This Season, by M. T. Munn (p. 7); and Need Improved Strains of Legume Bacteria, by A. W. Hofer (p. 12).

Forty-ninth Annual Report [of Cornell Station], 1936, C. E. Ladd et al. (*[New York] Cornell Sta. Rpt. 1936, pp. 63–162*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Service to agriculture: Report of the West Virginia Agricultural Experiment Station for the biennium ending June 30, 1936, F. D. Fromme (*West Virginia Sta. Bul. 278 (1936), pp. 40, figs. 4*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Kansas College and Station.—The legislature has appropriated $2,511,000 for the support of the institution during the biennium beginning July 1, 1937. This includes as special items $450,000 to replace the physical science building burned in 1934, $106,700 for the four substations, $42,000 for outlying experiment fields, $30,000 for laboratory equipment, $30,000 for research on diseases of livestock, and $160,000 for extension. The physical science building will be a three-story limestone structure 300 ft. long with 80-ft. wings, and it is hoped to have it ready for occupancy in the fall of 1938.

Thomas E. Will, professor of political economy from 1894 to 1897 and president from 1897 to 1899, died in Belle Glade, Fla., on March 5 at the age of 75 years.

Nevada Station.—In cooperation with the U. S. D. A. Forest Service and the Division of Irrigation of the Bureau of Agricultural Engineering, the station is inaugurating a study of spring precipitation in the Lamoille Basin of the larger Humboldt River Basin. The purpose of the project is to determine the relative rainfall at a higher elevation in terms of precipitation on the basin floor, in order to determine the weight that should be given the spring precipitation in forecasting the total run-off.

A shelter cabin has been erected midway between Jarbidge and Marys River Basin for the better protection of snow surveyors. As funds become available, similar cabins will be erected in the various basins of the State.

Cornell University.—A State appropriation of $30,000 has been provided for the construction of two greenhouses, each 100 by 35 ft., to be used for potato research by the departments of plant pathology and plant breeding. The houses will be partitioned into several sections, all beds will be tiled for steam sterilization, and blower fans will be used for forced air ventilation. Several small gas-proof sections will be constructed for studying the virus diseases of potatoes.

In further development of the program previously noted (E. S. R., 68, p. 876), action has been taken by the trustees of Cornell and Syracuse Universities whereby all instructions in professional forestry, both graduate and undergraduate, offered under State auspices will be concentrated after July 1 in the New York State College of Forestry at Syracuse. All professional instruction in wildlife conservation and management will be offered in the New York State College of Agriculture at Ithaca. The degree of master of forestry will no longer be given at Cornell, and its department of forestry will limit its instruction to nonprofessional courses designed to round out, as to forestry, the program of students of agriculture or of wildlife conservation and management. The extension work, however, will be continued, as well as the development of research forest properties and certain phases of other research in forestry, such as forest soils and forest pathology. C. H. Guise, professor of forest management, has been transferred to the office of resident instruction of the College of Agriculture, where he has served since February 15 as professor of personnel administration.

Provost A. R. Mann has resigned to become vice president of the General Education Board, effective July 1.

New York State Station.—Drs. G. J. Hucker and Carl S. Pederson, chiefs in research in bacteriology, have been granted leaves of absence for 6 months. Dr. Hucker will spend 4 months in New Zealand conferring with bacteriologists, dairy specialists, and veterinarians on the detection and control of mastitis and septic sore throat, dividing his time between the University of Hamilton, the Veterinary Laboratory at Wal aceville, and the Dairy Research Institute at Palmerton North. Dr. Pederson will study sugar spoilage in Cuba.

Majorie Rogers Crawford resigned as librarian March 15 to engage in commercial library work and has been succeeded by Rachel Evans Hening. Dr. Frederick W. Hayward has been appointed assistant in research (chemistry).

Pennsylvania College and Station.—Winfred W. Braman, associated with the station and the Institute of Animal Nutrition since 1903 and at the time of his retirement in 1936 associate professor of animal nutrition, died March 24 at the age of 63 years. A native of Massachusetts, he was graduated from Worcester Polytechnic Institute in 1897 and received the M. S. degree from the college in 1908. He has been succeeded by Dr. Seth R. Johnson.

Utah College and Station.—Dr. W. E. Carroll, professor and chief of swine husbandry in the Illinois University and Station, has been appointed dean of the School of Agriculture and animal husbandman in the station, effective July 1.

Virginia Station.—Frances Hicks Bass, assistant in household engineering, resigned March 31. R. E. O'Brien, Jr., has been appointed assistant agronomist, effective March 1.

Washington College and Station.—A substantial increase in appropriations for the next 2 years will permit of some much needed additions to the teaching and research staffs and some increases in maintenance allotments. A special appropriation of $62,500 was made for the establishment of a tree fruit substation in the Wenatchee fruit-growing region.

Through the new Department of Social Security of the State and the State Planning Council, a fund of $37,000 has been allotted for soil surveys for the biennium ending March 31, 1939. The work will be a part of the project on soil survey and land classification conducted by the station in cooperation with the State Planning Council.

Robert D. Eichmann has been appointed assistant entomologist in the station beginning April 10. Walter J. Clore, research assistant in horticulture, has been appointed assistant horticulturist of the main station and horticulturist of the Irrigation Substation, and will work primarily on problems of vegetable crops.

American Meteorological Society.—At a meeting held at the U. S. D. A. Weather Bureau, Washington, D. C., April 28–29, 1937, the principal themes were long-time trends of weather, droughts, and long-range forecasting pertinent thereto; and physical bases for the development and movement of pressure systems and the air masses of which they are constituted, with suggestions of lines along which further research is especially needed. Sound films prepared by the Department of Agriculture on the subjects of Fire Weather and Flood Weather were presented, and there was an exhibit of radiometeorographs. A joint session was held with the American Geophysical Union.

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